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Geology of

Carbonatite – Alkalic Rock Complexes in Ontario:

Wapikopa Lake Alkalic Rock Complex

District of Kenora

Ontario Geological Survey
Study 52

by R. P. Sage

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Foreword

The Wapikopa Lake Alkalic Rock Complex was examined as part of a project to study alkalic rock – carbonatite complexes in Ontario. The study describes the rock types and mineralogy of the complex and outlines the history of the mineral exploration efforts within the complex.

V.G. Milne

Director
Ontario Geological Survey

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CONVERSION FACTORS FOR MEASUREMENTS IN ONTARIO GEOLOGICAL SURVEY PUBLICATIONS

Conversion from SI to Imperial			Conversion from Imperial to SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
		LENGTH			
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709 7	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
		AREA			
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
		VOLUME			
1 cm^3	0.061 02	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.308 0	cubic yards	1 cubic yard	0.764 555	m^3
		CAPACITY			
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
		MASS			
1 g	0.035 273 96	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 75	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 62	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 908 8**	t
		CONCENTRATION			
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

1 ounce (troy) per ton (short)	20.0	pennyweights per ton (short)
1 pennyweight per ton (short)	0.05	ounces (troy) per ton (short)

Note: Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries, published by the Mining Association of Canada in cooperation with the Coal Association of Canada.

Geology of
Carbonatite – Alkalic Rock Complexes in Ontario:
Wapikopa Lake Alkalic Rock Complex
District of Kenora

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1. Geologist, Precambrian Geology Section, Ontario Geological Survey, Toronto. Manuscript approved for publication by John Wood, Chief Geologist, Ontario Geological Survey, October 19, 1983.

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Abstract

The Wapikopa Lake Alkalic Rock Complex lies within the Gods Lake Subprovince of the Superior Province of the Canadian Shield. The complex is oval in plan view and consists of an outer ring of mafic syenite and a core of coarser-grained, more leucocratic syenite. The complex has been dated by K-Ar isotopic techniques at 2534 ± 147 Ma. The complex has been intruded by fine-grained, granitic aplite dikes.

Analytical work indicates an unusually high barium content for the complex when compared to other Early and Late Precambrian alkalic rock complexes; however, the other elements appear to have a distribution pattern typical of alkalic rocks.

The intrusion is not known to contain mineralization of potential economic interest. A golden peristeritic sheen on the feldspars indicates that the complex should be evaluated as a possible source of building stone.

Résumé

Le complexe rocheux alcalin du lac Wapikopa est situé dans la sous-province du lac Gods, dans la province Supérieure du bouclier canadien. Vu en plan, le complexe est ovale et est formé d'une enveloppe de syénite mafique et d'un noyau de syénite à grain plus gros et plus leucocrate. D'après les techniques isotopiques de datation au K-Ar, l'âge du complexe est de 2534 ± 147 Ma. Des dykes granitiques aplites à grain fin ont fait intrusion dans le complexe.

Les analyses effectuées révèlent une teneur anormalement élevée en baryum comparativement à d'autres complexes rocheux alcalins du Précambrien inférieur et supérieur. Toutefois, la répartition des autres éléments semble typique aux roches alcalines.

On ignore si la minéralisation de l'intrusion représente une valeur commerciale intéressante. Le reflet péristéritique de couleur or du feldspath indique que le complexe devrait être évalué afin de déterminer s'il pourrait servir de pierre à bâtir.

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Introduction

A brief examination of the Wapikopa Lake Alkalic Rock Complex was undertaken as part of a study by the author of alkalic rock – carbonatite complexes. This intrusion is of Early Precambrian age, having been dated by K–Ar isotopic methods at 2534 ± 147 Ma (Bell and Watkinson, Carleton University, unpublished data; Sage 1986) and is one of a number of such plutons in the Canadian Shield of Ontario. Exploration company data submitted for assessment credit to the Assessment Files Research Office of the Ontario Geological Survey indicate that alkalic rock complexes of Early Precambrian age have relatively little economic value when compared to those of younger age. The study of the Wapikopa Lake complex was thus undertaken to provide data to compare older, possibly less mineralized, alkalic rock complexes with the younger plutons containing greater concentrations of mineralization of economic interest.

The Wapikopa Lake Alkalic Rock Complex is an asymmetrically zoned complex that varies from a mafic syenite, rich in pyroxene, apatite and sphene, along its southwestern margin to a leucocratic feldspar–rich core. Sharp contacts between the various phases are lacking or were not observed due to lack of exposure. The feldspars are tabular and commonly have a preferred orientation that defines a trachytoidal texture. A prominent northeast–trending linear cuts the northwest corner of the complex and has served as a site for later granitic aplite intrusions.

No evidence of carbonatite intrusion or fenite development was observed. Rocks of a silica over– and under–saturated nature do not occur within the intrusive complex.

There is no record of exploration work on the complex. Evidence for old claim staking was found by members of the field party. While accumulations of apatite of economic interest may occur in the peripheral mafic phase of the intrusion, the overall economic potential is low.

Acknowledgments

Mr. W. Wright, senior geological assistant, mapped the eastern portion of the complex. Mr. P. Chamois and Mr. C. Higgins assisted Mr. Wright and the author in the mapping process. In 1988, Mr. A. Lisowyk recalculated the statistical compositions of the lithologic units and revised the tables of analytical data in Appendix A.

Data collected by Mr. W. Troup, senior geological assistant, during Operation Winisk Lake (Thurston *et al.* 1979) has been incorporated into the map.

Aircraft for the project were provided by Severn Enterprises Limited at Pickle Lake and the Hudson Bay Company, Pickle Lake, provided groceries and hardware supplies.

Location and Access

The Wapikopa Lake Alkalic Rock Complex (Figure 1) lies at approximately 52°54'35"N Latitude and 88°00'W Longitude. Access to the complex is by float–equipped aircraft from Pickle Lake to Wapikopa Lake which is an expansion of the Winisk River. Wapikopa Lake lies approximately 218 km northeast of Pickle Lake. The alkalic complex is bordered on the northwest by Wapikopa Lake and on the east by Chipai Lake.

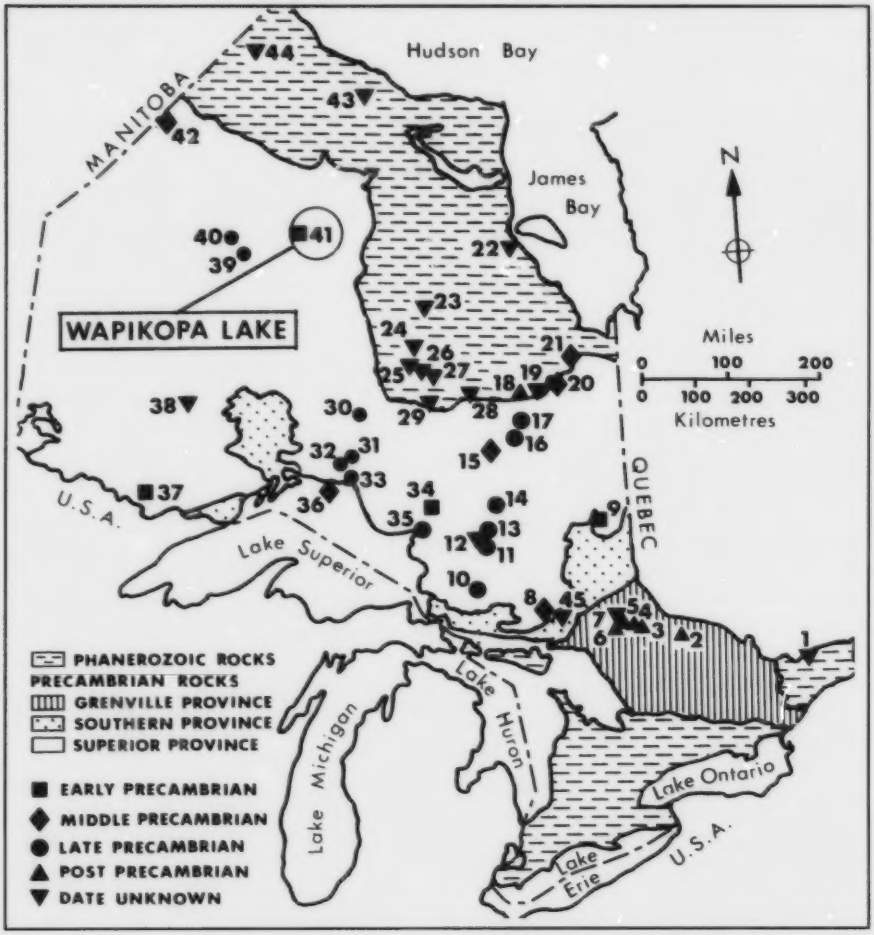

Figure1. *Key map showing location of carbonatite - alkalic rock complexes in Ontario.*

1. *Eastview*
2. *Brent*
3. *Callander B.*
4. *Manitou Is.*
5. *Burritt Is.*
6. *Iron Is.*
7. *Lavergne*
8. *Spanish R.*
9. *Otto Stock*
10. *Seabrook L.*
11. *Lackner L.*
12. *Borden Tp.*
13. *Nemegosenda L.*
14. *Shenango Tp.*
15. *Cargill Tp.*
16. *Teetzel Tp.*
17. *Clay-Howells*
18. *Hecla-Kilmer*
19. *Valentine Tp.*
20. *Goldray*
21. *Argor*
22. *Lawashi R.*
23. *Poplar R.*
24. *Albany Forks*
25. *L. Drowning R.*
26. *Kingfisher R. West*
27. *Kingfisher R. East*
28. *Martison L.*
29. *Nagagami R.*
30. *Chipman L. (dikes)*
31. *Killala L.*
32. *Prairie L.*
33. *Port Coldwell*
34. *Herman L.*
35. *Firesand R.*
36. *Slate Is.*
37. *Poohbah L.*
38. *Sturgeon Narrows & Squaw L.*
39. *Schryburt L.*
40. *Big Beaver House*
41. **Wapikopa L.**
42. *"Carb" L.*
43. *Gooseberry Br.*
44. *Niskibi L.*
45. *Nemag L. & Lusk L.*

Scattered outcrops occur within the interior of the complex along the west, north and east sides, but the best exposures are along Wapikopa Lake on the northwest corner of the complex. Outcrop is rare in the southern portion of the complex.

The complex has a surface area of approximately 18 km² and its oval shape, elongated along an east–west axis, is well illustrated on aeromagnetic maps (ODM–GSC 1960a,b).

Field Methods

Outcrops of bedrock were noted on acetate overlays on airphotos at a scale of 1:63 360 obtained from the National Airphoto Library, Ottawa. The data were transferred from the acetate overlays to a cronoflex base map at a scale of 1:31 680 using dividers. The cronoflex base was prepared by the Cartography Section, Ontario Ministry of Natural Resources. Samples and data collected during Operation Winisk (Thurston *et al.* 1979) have been incorporated into the map.

Previous Geological Work

The location and general shape of the Wapikopa Lake Alkalic Rock Complex were first recorded by Emslie (1962) and Bostock (1962). Their work was part of a regional geologic reconnaissance program. In 1971, a brief reconnaissance survey of the complex was undertaken during Operation Winisk (Thurston *et al.* 1971, 1979).

Physiography

The complex is covered by generally low swampy ground separated by ridges of glacial till. Relief is estimated to be 15 m or less. Outcrop is difficult to locate on the airphotos. High ground, which appeared to be outcrop on the airphoto, generally turned out to be glacial till. It is not unusual to find the occasional small bedrock exposure in swampy low areas.

Laboratory Technique

All samples being considered for complete rock analysis were thin sectioned and stained for potassium feldspar. The staining has aided in feldspar identification but made the associated pyroxenes rather turbid. All thin sections were briefly examined and petrographic descriptions of those samples submitted for total rock analysis appear in Appendix A. Several minerals tentatively identified in the field were checked by X–ray diffraction techniques.

General Geology

The Wapikopa Lake Alkalic Rock Complex (Table 1, Figure 2 and Figure 3, Chart A, back pocket) is of Early Precambrian age, dated by K–Ar isotopic methods at 2534 ± 147 Ma (Bell and Watkinson, Carleton University, unpublished data; Sage 1986). The alkalic rocks of the complex can be divided into two major types: (1) pyroxene–rich, mafic syenite peripheral to the intrusion along the southwest flank; and (2) coarse–grained syenite typical of the core.

The mafic–rich syenite of the rim is massive, medium grained, black to green–black, and with increasing feldspar content, grades to the coarse–grained more leucocratic syenite of the core. The more mafic phases commonly contain an estimated 15% apatite. Isolated sphene crystals are not uncommon. The best exposures of the mafic syenite occur in the southwest corner of the complex and along the shoreline of Wapikopa Lake. Outcrops of this unit are sparse and geologic mapping, combined with aeromagnetic data (ODM–GSC 1960a,b), indicate that this is a peripheral unit, most likely an arcuate mass which does not completely enclose the syenite core.

TABLE 1. TABLE OF LITHOLOGIC UNITS FOR THE WAPIKOPA LAKE ALKALIC ROCK COMPLEX.

CENOZOIC

Recent

Swamp and stream deposits

Pleistocene

Glacial deposits

Unconformity

EARLY PRECAMBRIAN

Post–Tectonic Granitic Rocks

Granitic Aplite and Pegmatite Dikes

Granite pegmatite; granite aplite; granite.

Intrusive Contact

Wapikopa Lake Alkalic Complex

Syenite Dike Rocks

Syenite, fine to medium grained, leucocratic, aplitic dikes and segregations.

Coarse–Grained Syenite Core Rocks

Syenite, <10% pyroxene, coarse grained, leucocratic.
Syenite, medium to coarse grained, commonly porphyritic.

Mafic, Medium–Grained Syenite Rim Rocks

Mafic syenite, >50% pyroxene, commonly trachytoidal.
Mafic syenite, <40% pyroxene, medium to coarse grained.
Mafic syenite, >40% pyroxene, medium grained.

Intrusive Contact

Pre– or Syntectonic Granitic Rocks

Orthogneiss

Trondhjemite, granodiorite, massive to schistose.

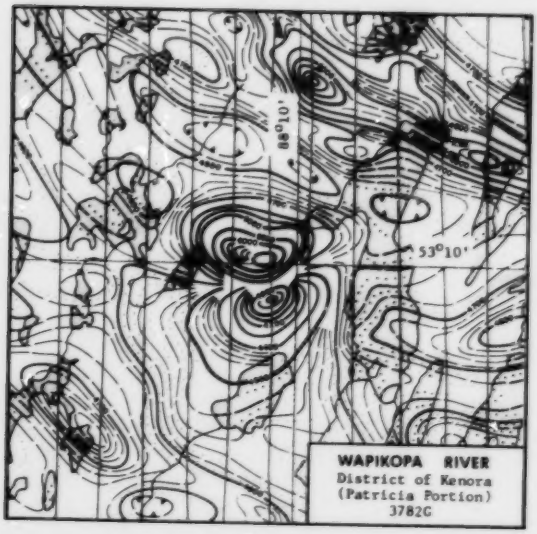

Figure 2. *Aeromagnetic map of the Wapikopa Lake Alkalic Rock Complex, from aeromagnetic maps 979G and 969G (ODM-GSC 1960a,b).*

The core of the complex is composed largely of coarse-grained syenitic rocks that are pink-grey in colour. The syenitic rocks are equigranular to inequigranular-porphyritic-seriate, and composed of 70 to 90% potassium feldspar set in a black, interstitial pyroxene matrix. The rocks locally have trachytoidal textures which define a foliation parallel or subparallel to the general outline of the pluton. The syenitic rocks of the periphery of the body do not appear to differ greatly in mineralogy from those found at the core.

Regional mapping by Thurston *et al.* (1971, 1979) indicated that the intrusion was emplaced into Early Precambrian felsic intrusive and metamorphic rocks of the Gods Lake Subprovince of the Superior Province of the Canadian Shield.

A prominent northeast-striking linear cuts the northwest corner of the complex. Fine-grained, leucocratic, pink aplitic granite occupies the linear and cuts the syenitic rocks along this trend.

Bell and Watkinson (unpublished data) reported a K-Ar isotopic age of 2534 ± 147 Ma for the complex. This age is likely a minimum age since the complex would be anticipated to have undergone a thermal event and isotopic readjustment at the time of granitic diking.

The complex does not have an associated carbonatite intrusion or a fenitic halo. The rocks represent a silica saturated suite. Table 1 lists the lithological units for the Wapikopa Lake Alkalic Rock Complex and Figure 3 (Chart A) is a geological map of the complex.

EARLY PRECAMBRIAN (ARCHEAN)

PRE- OR SYNTECTONIC GRANITIC ROCKS

Orthogneiss

Rocks into which the Wapikopa Lake Alkalic Rock Complex was emplaced were mapped only in the extreme southeastern corner of the map area. Insufficient exposure is present to make a definitive interpretation as to the nature of the enveloping rocks, but they are thought to be orthogneisses rather than paragneisses. The granitic exposures examined during this project are generally massive, however the broader regional mapping by Thurston *et al.* (1971) indicated that the dominant granitic rocks are gneissic.

The exposures examined are medium to coarse grained, massive and sometimes are extensively diked with coarse–grained granitic pegmatite. The rocks are pink on both the fresh and weathered surfaces. In thin sections of the finer–grained rocks, the rocks are fine to medium grained, massive, equigranular and allotriomorphic with curved to straight grain boundaries. They vary from trondhjemite to granodiorite in composition and have undergone at least a mild metamorphic event. A thin section estimate of the mode is: 15–20% biotite, 45–50% plagioclase (An35–32), 0–15% microcline and 30–35% quartz. Sericite, magnetite, and apatite occur in trace amounts.

WAPIKOPA LAKE ALKALIC ROCK COMPLEX

The mineralogy of the Wapikopa Lake Alkalic Rock Complex is relatively simple. There is little suggestion of major intrusive relations between the various phases, even though on an individual outcrop there may be a suggestion of crosscutting of one phase by another. The most unusual feature of the intrusion is the pervasive presence of sphene in quantities of several percent. The mafic minerals within the coarse–grained syenite core appear to have formed by crystallization of an original intercumulus liquid between the feldspars. Locally, the more mafic portions appear to be auto–injections that intrude the more feldspar–rich portions. Trachytoidal textures defined by the parallel alignment of the tabular feldspars are best developed in the more mafic portions (mafic content greater than 10%) of the coarse–grained syenite core.

Mafic Syenite Rim Rocks

The mafic syenites of the rim (Units 2d,f,g) are located in the southwest corner of the intrusion. The mafic syenites weather dark green, grey green and on fresh surfaces are greenish black to grey–green. The rocks are characterized by acicular dark green pyroxenes that are 8–10 mm in length and less than a millimetre in diameter.

In the medium–grained varieties, pyroxene comprises 40 to 70% of the rock (Unit 2g). Brown, resinous apatite forms up to 15% of the rock, and dark brown, euhedral, wedge–shaped sphene crystals up to several millimetres are sometimes recognizable.

A more leucocratic phase of the mafic syenite is medium to coarse grained and contains between 25 and 50% pyroxene (Unit 2f). A coarse–grained, trachytoidal, porphyritic phase of the medium– to coarse–grained syenite is locally present (Unit 2d). Apatite and sphene are not as abundant in the coarser–grained, more leucocratic lithologies. The coarser–grained, feldspar–rich syenite

TABLE 2. MICROPROBE ANALYSES OF POTASSIUM FELDSPAR IN MAFIC SYENITE*, WAPIKOPA LAKE ALKALIC ROCK COMPLEX (P. MORTEN, CARLETON UNIVERSITY, PERSONAL COMMUNICATION 1977).

	1	2	3
CaO	0.01	0.02	0.01
SiO_2	61.99	61.17	60.90
K_2O	13.90	12.87	12.49
Al_2O_3	19.18	20.18	20.20
BaO	2.69	4.53	5.11
Na_2O	1.66	1.70	1.65
TOTAL	99.36	100.47	100.36

*Sample WPR3-15A.

phases sometimes appear gradational into the medium-grained, more mafic syenite. The more mafic, medium-grained rock may possibly be a cumulate phase of the complex.

In thin section, the medium-grained mafic syenite (Unit 2g) is massive, equigranular and hypidiomorphic. The coarser phases (Units 2d, 2f) are medium to coarse grained, equigranular to inequigranular-porphyritic-seriate, and hypidiomorphic. The mode is estimated to consist of 2-85% perthite, 20-80% clinopyroxene, 0-5% sphene and trace to 1.5% apatite. The pyroxene crystals are light green, weakly to moderately pleochroic and have the extinction angles of aegirine-augite to augite. The pyroxene poikilitically encloses small euhedral apatite crystals and more rarely wedge-shaped sphene crystals. Larger sphene crystals occur marginal to, or between the pyroxene grains. Large anhedral grains of apatite occur between and marginal to pyroxene. The feldspar is a cryptoperthite that is both interstitial to and encloses the pyroxene, sphene, and apatite. In bright sunlight some of the larger feldspar grains display a golden sheen. In several samples of the coarser-grained syenite, the feldspars form large optically continuous grains (up to 1 cm across) and contain inclusions of clinopyroxenes.

Mitchell and Platt (1978) interpreted the large, optically continuous feldspars at Poohbah Lake to have formed by the crystallization of cumulus pyroxene and intercumulus feldspar. The author would interpret the similar texture in the Wapikopa rocks to have formed in the same manner. This textural feature is similar to that found in some of the malignites observed by the author at Poohbah Lake and at the geologically much younger Nemegosenda Lake intrusion. There is no evidence of nepheline in the Wapikopa rocks, so a comparison with the malignites at Nemegosenda and Poohbah Lakes relates only to the feldspars. The feldspars display a stringy perthitic texture at high magnification but appear homogeneous at low power. Carlsbad twinning of the feldspars is common. One thin section displays weak concentric zoning of the feldspars. Barium is present in geochemically anomalous amounts in some samples of the rim syenite. Probe analysis of the potassium feldspar in sample WPR3-15A indicates a relatively high barium content. Feldspar compositions are given in Table 2.

Rarely, a trace of light green pleochroic amphibole mantles the pyroxene. The amphibole likely formed as an alteration of the clinopyroxene. Trace amounts of magnetite, microcline, quartz and zircon were noted.

Coarse-Grained Syenite Core Rocks

The core syenites (Unit 2b,c) are gradational with the rim syenites and no cross-cutting intrusive relations were found. The lack of identifiable intrusive relations

may be a function of lack of outcrop. While the mineralogy is the same, the texture of the core syenites is decidedly different from the rim syenites.

The dominant lithology is coarse-grained pyroxene syenite (Unit 2c), while a very minor lithology consists of feldspar-rich leucocratic syenite (Unit 2b). The feldspar-rich phase possibly represents a feldspar cumulate derived from the more dominant pyroxene syenite.

On weathered surfaces, the syenites of the core are grey-pink, pink-grey, or grey-buff in colour. On fresh surfaces they are generally a pink-grey colour. The more mafic exposures generally have the best developed trachytoidal texture. These more mafic phases sometimes form auto-intrusions into the more leucocratic feldspar cumulates. The mafics are commonly interstitial to the feldspars. While trachytoidal textures defined by the orientation of the tabular feldspars are common, mafic segregation banding is rarely present as wispy streaks on the outcrop surface.

In thin section, the core syenites are medium to coarse grained, inequigranular, porphyritic-seriate, allotriomorphic to hypidiomorphic. The mode is estimated to be 30-80% perthite, 0-80% plagioclase, 5-35% clinopyroxene, 0-2% apatite and trace to 10% sphene. Trace to minor amounts of microcline, amphibole, magnetite, biotite, quartz, carbonate, zircon, pyrite, garnet, sericite, epidote, and possibly stilpnomelane, were observed in one or more samples. The clinopyroxene occurs as euhedral, subhedral and anhedral grains of a light green colour, with weak pleochroism and the extinction of aegirine-augite to augite. The pyroxene comprises up to a visually estimated 30% of any given slide. In several sections the pyroxene is relatively colourless, very weakly pleochroic, and has the extinction angle of augite. In general, the extinction angles are slightly greater than those of augite and just fall into the range characteristic of the aegirine-augite group (Kerr 1977). Euhedral grains of clinopyroxene are more common in the more mafic phases of the syenite and they become more anhedral and interstitial in the more leucocratic phases. The pyroxene is often partially replaced by a mantle of light green pleochroic amphibole that has the extinction of hornblende. The occurrence of amphibole mantling pyroxene appears to increase towards the centre of the complex. In some thin sections, amphibole comprises an estimated 10-15% of the rock, and pyroxene is present only as relict cores.

Sphene is common throughout the core of the intrusion. In the more mafic phases, small wedge-shaped sphene crystals may occur poikilitically enclosed in the pyroxene. Sphene occurs marginal to and between the pyroxene grains. Generally, the sphene occurs as wedge-shaped, euhedral crystals, however some subhedral and anhedral grains are also present. The larger crystals are sometimes well twinned.

Apatite is present in quantities estimated at 1-2%. It occurs as tiny euhedral crystals poikilitically enclosed in pyroxene, or as large anhedral grains marginal to, and between, the pyroxene grains.

Plagioclase (An1-12) is the second most abundant feldspar. The plagioclase occurs as: (1) anhedral interlocking mosaics of grains marginal to and enclosing the larger perthite; (2) exsolved lamellae in the perthite grains; and (3) rims on the larger perthite grains.

The perthites occur as large subhedral grains with ragged edges and generally well developed Carlsbad twinning. In thin section, the perthites range from cryptoperthite in which a weak suggestion of the perthitic texture is evident only at

highest magnification, to string perthite and patch perthite. String perthite is most common, followed closely by cryptoperthite. The perthitic nature of the feldspars can be easily recognized on the outcrop by a golden sheen in bright sunlight. Some thin sections display the sheen in artificial light. The string perthite becomes coarser and more well developed towards the core of the intrusion. The patch perthite is very local in distribution and likely formed by local autometamorphism, or deuteric replacement of earlier formed plagioclase by potassium feldspar. The string perthite feldspars likely formed as a result of exsolution of a hypersolvus feldspar. Uncommonly, the quadrille twinning of microcline is observed in some feldspar grains.

The interlocking mosaic of plagioclase that encloses the larger perthite grains may be the result of subsolvus crystallization of plagioclase, or of recrystallization of exsolved plagioclase from the perthite. Because of the fresh, unmetamorphosed and unstressed appearance of the plagioclase, the author favours the former interpretations.

Several thin sections display weak undulatory extinction in the larger perthite grains. Rarely, very minor perthite occurs as fracture fillings in the larger perthite grains, defining a protoclastic texture.

Syenite Dike Rocks

Fine- to medium-grained syenite dike rocks (Unit 2a) were observed at several locations in the northwest corner of the complex. The dikes are pale red on fresh and weathered surfaces. In thin section, the rock is fine to medium grained, equigranular, massive, allotriomorphic with straight to curved grain boundaries. The rock is composed of a visually estimated 35–40% plagioclase (An34), 35–40% microcline, 10% light green hornblende, and 5–10% sphene. Pyrite, biotite, zircon, and magnetite are present in trace amounts.

Coarse-grained syenite pegmatites were noted in several outcrops along the southwest corner of the complex and on the north side of the island on the west side of the complex (not coded on Figure 3). These dikes of syenite consist of very coarse-grained microcline perthite. Individual cleavage faces up to 8 cm on an edge are present. Since the pegmatite-syenite contacts are gradational in appearance, the author interprets these pegmatites to be segregations from the syenite magma.

Xenoliths Within the Syenite

Thin sections were prepared from a number of xenolithic fragments in the syenite. A section from one xenolith consists of very fine-grained pyroxene, perthite, albitic plagioclase and minor apatite. A section from a second xenolith consists of very fine-grained feldspar, actinolite and biotite. On the basis of mineralogy, these two xenoliths likely represent an early, finer-grained phase of the intrusion and are thus autoliths.

A third xenolith, mafic in appearance, contains biotite, actinolite and pyroxene, while a fourth xenolith also mafic in appearance, contains actinolite, phlogopite, magnetite and clinozoisite(?). These xenoliths (Photo 1) would appear to represent segmented portions of earlier formed mafic dikes though the possibility that they represent altered, early, cumulate phases of the syenite cannot be discounted.

Photo 1. *Pyroxene-rich inclusions within medium- to coarse-grained syenite. Location P-2.*

POST-TECTONIC GRANITIC ROCKS

Granitic Aplite and Pegmatitic Dikes

Granitic aplite intrusions form a mappable unit along a pronounced northeast-striking linear in the northwest corner of the complex. They also occur at several locations along the southwest corner of the complex. These intrusions have sharp, discordant contacts with the syenite.

Those outcrops in the northwest corner of the complex, occupying the linear structure, are weakly gneissic. They weather pale pink and are red-brown on fresh surfaces. In thin section they are fine grained, equigranular, massive, allotriomorphic, with straight to curved grain boundaries. The mode is estimated to be 35% quartz, 40–45% microcline, 0–25% plagioclase and 1–15% biotite. Sphene, myrmekite and sericite are present in minor quantities. The dikes range from quartz monzonite to granite in composition.

Some of the coarse-grained syenites display some evidence of cataclastic textures on the weathered outcrop surface, in proximity to the aplite dike that occupies the northeast-trending linear in the northwest corner of the complex. The dike may be occupying a shear zone cutting the alkalic complex.

METAMORPHISM

A lack of outcrop in proximity to the complex prevents any assessment of the metamorphic grade of the enclosing wall rocks or contact metamorphic effects of the syenite intrusion. The complex itself lacks visual evidence of contact metamorphism on the outcrop surface. A weak protoclastic texture in a number of thin sections and the anhedral, interlocking, granoblastic-appearing mosaic of

fine–grained plagioclase enclosing the larger perthite grains may imply a weak cataclastic–metamorphic event. A number of thin sections display a patch perthite texture which is interpreted by the author to indicate a late stage autometamorphic or deuteric event of potassium feldspar replacement of plagioclase. The protoclastic texture most likely represents deformation of the crystals as they were intruded as a crystal mush.

A number of thin sections display pyroxene in various stages of alteration to a light green pleochroic amphibole. The breakdown of pyroxene to amphibole is considered by the author to be a deuteric or autometamorphic feature that took place during the final stages of cooling of the syenite complex and did not occur during a regional metamorphic event. The thin sections that display the most intense development of amphibole rims on the pyroxene also generally display the most abundant development of anhedral to subhedral perthite grains enclosed in a fine–grained, anhedral, interlocking, granoblastic–appearing matrix of plagioclase.

PETROLOGY

The chemical analyses presented in Tables A–2 and A–3 (Appendix A) most likely represent original cumulate phases within an intruding crystal mush and are thus not likely to represent liquid compositions. The norms (Table A–4, Appen-

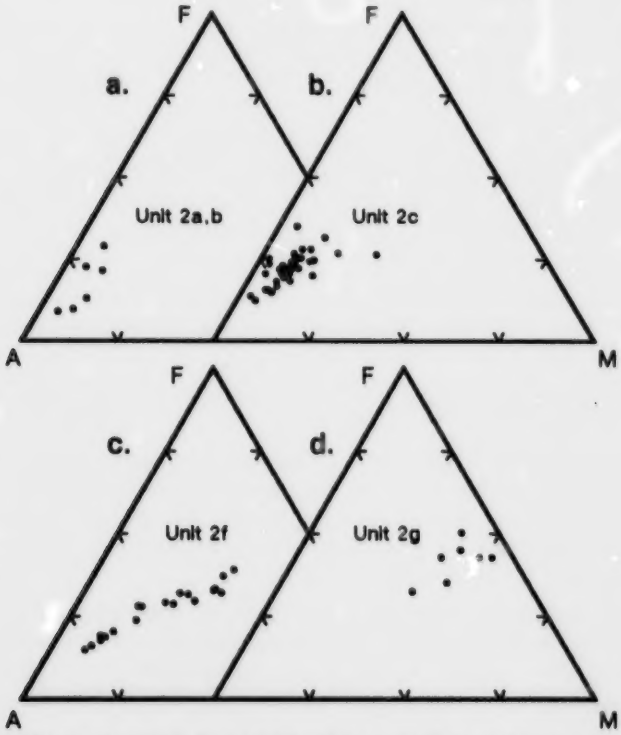

Figure 4. *AFM plot of samples from the Wapikopa Alkalic Rock Complex.* **a.** *Leucocratic syenite of the core (unit 2a, 2b).* **b.** *Syenite of the core (unit 2c).* **c.** *Mafic syenite (<40% pyroxene) of the rim (unit 2f).* **d.** *Mafic syenite (>40% pyroxene) of the rim (unit 2g). A = Al_2O_3; F = FeO(total); M = MgO.*

dix A), calculated by the procedure outlined by Irvine and Baragar (1971), are given for comparison with alkalic rock complexes of similar age or younger.

Figure 4 shows AFM plots of samples from the Wapikopa Lake Alkalic Rock Complex. The mafic syenite (Figure 4d, Unit 2g) shows a fair cluster of data points, and the associated, more leucocratic phase (Figure 4c, Unit 2f) displays a linear trend. This pattern is to be expected since considerable variation exists between the relative quantities of the mafic and felsic components and also because the rocks are likely cumulates. The peripheral syenites were classified separately from the core units, in part, on grain size rather than mineralogy; thus, there is a great deal of chemical overlap with the core syenite. Rocks of the coarse-grained pyroxene syenite of the core display a strong preference towards the "A" corner of the diagram, which results from their relatively low mafic content and high alkali feldspar content (Figure 4b, Unit 2c). While the data shows some scatter, the unit does display a tendency to strongly cluster to the left centre of the diagram.

If all four data plots are superimposed a linear trend from the *A* apex to the *F–M* tie line would be present. This trend reflects varying mafic–felsic mineral ratios used in mapping and not in magma compositions.

The major element chemistry is typical of the alkalic rock suite. The minor elements display enrichment in barium and strontium, which is in part typical of alkalic rock suites (Gerasimovsky 1974). It is most unusual, however, to find anomalously high barium values throughout this rock suite. The barium (BaO) values approach 1.5% and are present in barium–bearing potassium feldspar (see Table 2). The author has not observed such high barium contents in other alkalic rock complexes, such as Sturgeon Narrows or Poohbah Lake, which may be of equivalent age.

Both titanium and phosphorus tend to be enriched in the mafic syenite rim of the complex, which is likely a cumulate phase. This fine-grained mosaics of plagioclase may represent recrystallized plagioclase exsolved from the perthite or subsolvus crystallization. These same rocks also display the most abundant development of string perthite.

On the basis of petrographic evidence the author proposes that the complex has undergone a mild metamorphic event which has not seriously modified its original texture.

STRUCTURAL GEOLOGY

The Wapikopa Lake Alkalic Rock Complex lies within the Gods Lake Subprovince of the Superior Province. The lack of exposure of rocks enclosing the complex in conjunction with a lack of prominent features on aeromagnetic maps covering the complex (ODM–GSC 1960a,b) prevents any interpretation as to possible relationships with regional structures.

Trachytoidal textures, defined by the preferred orientation of feldspars within the syenite portion of the pluton, are steeply dipping and generally tangential to the outline of the complex. Rarely, mafic segregations within the syenitic rocks impart a banding to the rock which is parallel to the trachytoidal texture.

Where the coarse-grained syenite has its highest mafic mineral content, trachytoidal textures are likely to be better developed. With the exception of the medium-grained mafic rim of the complex, the pyroxenes are interstitial to the feldspars implying that they crystallized from an intercumulus liquid containing

potassium feldspar crystals. Since the mafic, liquid–rich portions of a magma cannot support stress, the better development of trachytoidal textures in the mafic–rich areas is in response to greater movement within the mafic–rich regions of the crystal mush during emplacement of the syenite complex. One exposure on the northwest corner of the complex displays an auto–intrusion of the intercumulus liquid into a leucocratic cumulate of coarse–grained feldspar.

Economic Geology

No assessment work has been filed for the area covering the Wapikopa Lake Alkalic Rock Complex, but evidence of former claim staking was noted by the field party.

RECOMMENDATIONS TO THE PROSPECTOR

Sulphide mineralization was not observed within this complex. Carbonatitic rocks were not found and evidence for the presence of fenites is lacking. Apatite in concentrations approaching 15% occurs in some of the rocks collected from the mafic phase of the complex on the southwest flank of the intrusion. This area of the complex may warrant some additional prospecting for the presence of accumulations of apatite. Large areas of the complex are drift covered and cannot be evaluated on the basis of field work. Except for the possibility of a local accumulation of apatite, the examination of available outcrop was not encouraging for the discovery of economic mineral deposits within this complex. The golden sheen to the perthitic feldspars would make it an attractive building stone.

RECOMMENDATIONS FOR FUTURE STUDY

Additional isotopic age studies on the complex are desirable. Mitchell (1976) completed a K–Ar isotopic study on the Early Precambrian Poohbah Lake Alkalic Rock Complex and obtained a K–Ar isochron age of 2706 $\pm$ 23 Ma. The Poohbah Lake complex is cut by granite pegmatites having an age of 2550–2630 Ma which is similar to the K-Ar isotopic age obtained on the Wapikopa Lake Alkalic Rock syenites which are diked by granitic aplite. The author suspects the Wapikopa Lake Alkalic Rock Complex will produce ages generally similar to those found by Mitchell (1976) at Poohbah Lake upon completion of additional work.

Detailed microprobe studies of the feldspars and clinopyroxenes are needed for petrologic modeling. Additional reconnaissance mapping should be done if access is improved.

Appendix A — Petrographic Descriptions, Chemical Analyses, Normative Compositions, and Statistical Compositions of Lithologic Units of the Wapikopa Lake Alkalic Rock Complex.

TABLE A-1. PETROGRAPHIC AND FIELD DESCRIPTIONS OF WHOLE-ROCK SAMPLES* FROM THE WAPIKOPA LAKE ALKALIC ROCK COMPLEX.

Reference No. 269
Sample No. WPR3-1

Melanocratic pyroxene syenite.

Field Description. Medium grained, massive, apatite-rich. Weathered and fresh surfaces are green-black. Map unit 2g.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Medium to light green pleochroic clinopyroxene forms euhedral to subhedral grains. Feldspar is interstitial to pyroxene; staining suggests very fine perthite. Optically it appears to be orthoclase.

Reference No. 270
Sample No. WPR3-2A

Melanocratic pyroxene syenite.

Field Description. Medium to coarse grained, trachytoidal, weakly banded, weakly porphyritic. Weathered surfaces are grey-green to green-black.. Map unit 2f.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Apatite is subhedral to euhedral, poikilitically enclosed within and marginal to pyroxene. Pyroxene is a clinopyroxene with subhedral to euhedral form. Potassium feldspar is likely a very fine-grained cryptoperthite. Feldspar shows a weak potassium stain concentrated along cleavage planes.

Reference No. 271
Sample No. WPR3-2B

Melanocratic pyroxene syenite.

Field Description. Medium grained, equigranular, massive, apatite-rich, gradational (?) into unit 2f. Map unit 2g.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Apatite is euhedral to anhedral and poikilitic in pyroxene. Sphene occurs as wedge-shaped grains between pyroxene grains. Pyroxene is a light to medium green pleochroic clinopyroxene. Feldspar is interstitial to pyroxene and optically fits orthoclase; staining suggests that it is a cryptoperthite.

Reference No. 272
Sample No. WPR3-5A

Melanocratic pyroxene syenite.

Field Description. Medium grained, massive, equigranular. The rock occurs as blocks in a coarser grained phase of similar mineralogy. Map unit 2g.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Clinopyroxene is euhedral to subhedral, light to medium green in colour. Apatite is euhedral to anhedral, poikilitic in pyroxene and marginal to pyroxene. Feldspar forms irregular interstitial grains. Potassium staining is more intense along cleavage directions.

Reference No. 273
Sample No. WPR3-5B

Pyroxene syenite.

Field Description. Coarse grained, inequigranular-seriate, massive. The outcrop includes blocks of unit 2g and is cut by small granitic aplite dikes. Weathered surfaces are grey-pink to grey-green. Map unit 2f.

**All samples were collected from outcrops. Reference numbers for samples are plotted on Figure 3 (Chart A).*

Petrographic Description. Medium grained, inequigranular-porphyritic-seriate, hypidiomorphic. Sphene and apatite are poikilitic in pyroxene. The pyroxene is light green to medium green clinopyroxene. Light green amphibole (hornblende) locally rims pyroxene. Mafic minerals form matrix to large feldspar crystals. Feldspars are subhedral, Carlsbad twinned crystals of orthoclase. There is weak sericite alteration of feldspar.

Reference No. 274
Sample No. WPR3-7

Pyroxene syenite.

Field Description. Coarse grained, massive. Weathered surfaces are grey-pink to grey-green, fresh surfaces grey-pink. Map unit 2f.

Petrographic Description. Coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Clinopyroxene is light green to medium green, euhedral to subhedral with poikilitic apatite and sphene. Some apatite, marginal to pyroxene, is irregular and anhedral in form. Light green amphibole mantles the ends of some pyroxene grains. Feldspar forms coarse grained, irregular Carlsbad twinned grains separated by medium grained mafic minerals. Feldspar is probably a cryptoperthite.

Reference No. 275
Sample No. WPR3-8B

Pyroxene syenite.

Field Description. Coarse grained, massive. Weathered surfaces are grey-pink to grey-green, fresh surfaces grey-pink. Map unit 2g occurs as xenoliths in outcrop. Map unit 2f.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Clinopyroxene forms subhedral to euhedral grains. Feldspar forms irregular grains interstitial to the pyroxene. Feldspar is Carlsbad twinned and several grains locally form interlocking mosaics. Apatite is poikilitic in pyroxene and also occurs as irregular grains marginal to the pyroxene. Pyroxene may be very weakly zoned.

Reference No. 276
Sample No. WPR3-9

Pyroxene syenite.

Field Description. Coarse grained, inequigranular-seriate, trachytoidal. Weathered surfaces are grey to black, fresh surfaces pink-grey to black. Feldspar phenocrysts up to 2 cm long make up approximately 30% of the rock. Map unit 2d.

Petrographic Description. Coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Pyroxene forms subhedral to euhedral grains, locally poikilitic with apatite and sphene. Feldspars have ragged edges, locally display well developed concentric zoning, have Carlsbad twinning, and a weak sericite alteration. Mafic minerals form a matrix enclosing larger feldspar grains.

Reference No. 277
Sample No. WPR3-9B

Pyroxene syenite.

Field Description. Medium to coarse grained, porphyritic with feldspars up to 1.5 cm. Weathered surfaces are pink to grey-green, fresh surfaces pinkish grey. Map unit 2f.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Amphibole occurs in trace amounts as a light green alteration of pyroxene. Pyroxene occurs as euhedral to subhedral crystals with poikilitic apatite and sphene. Some apatite forms large irregular grains associated with the pyroxene. Feldspar forms interlocking, anhedral mosaics, which locally partially enclose pyroxene.

Reference No. 278
Sample No. WPR3-10

Melanocratic pyroxene syenite

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate. Phenocrysts up to 2 cm in mafic groundmass comprise 30-40% of rock. Map unit 2d.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Sphene forms wedge-shaped crystals poikilitic within, and marginal to pyroxene. Pyroxene is a light green clinopyroxene, euhedral to subhedral in form. Feldspar is zoned and larger crystals are glomeroporphyritic. Feldspars are cryptoperthite and have ragged grain margins. Large feldspar grains are separated by medium grained mafic minerals.

Reference No. 279
Sample No. WPR3-13

Melanocratic pyroxene syenite.

Field Description. Medium to coarse grained, with well developed acicular pyroxene. Weathered surfaces are pink-green, fresh surfaces dark green-pink. Map unit 2f.

Petrographic Description. Medium grained, massive, equigranular, hypidiomorphic. Euhedral to subhedral clinopyroxene is light green to medium green and poikilitically encloses euhedral apatite and sphene. Large irregular grains of apatite occur marginally to some of the pyroxene grains. Feldspars are cryptoperthite, irregular in form and partially enclose the pyroxene.

Reference No. 280
Sample No. WPR3-15A

Pyroxene syenite.

Field Description. Medium to coarse grained, trachytoidal, and in sharp contact with more mafic medium grained phase. Weathered surfaces are pink, green-grey, fresh surfaces pink-green. Pyroxene occurs as long prismatic grains. Map unit 2f.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Sphene occurs as wedge-shaped crystals, some of which are poikilitic in pyroxene, and also occurs as irregular grains marginal to some of the pyroxene grains. Pyroxene is a light to medium green clinopyroxene. Feldspar forms irregular grains partially enclosing the pyroxene. Feldspar is cryptoperthite.

Reference No. 281
Sample No. WPR3-15B

Melanocratic pyroxene syenite.

Field Description. Medium grained, equigranular, massive, apatite-rich. Weathered surfaces are dark pink-green, fresh surfaces pink-green. Map unit 2g.

Petrographic Description. Medium grained, massive, equigranular, hypidiomorphic. Pyroxene occurs as euhedral to subhedral grains. Apatite and sphene occur poikilitically within pyroxene, and marginal to the pyroxene. Apatite marginal to pyroxene tends to be irregular in outline. Pyroxene is a light green clinopyroxene. Feldspar occurs as irregular grains partially enclosing the pyroxene.

Reference No. 282
Sample No. WPR3-17

Pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic-seriate. Weathered surfaces are dark pink-green, fresh surfaces pink-green. Pyroxene occurs in long prismatic grains. Map unit 2f.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Pale to light green clinopyroxene forms euhedral to subhedral grains. Apatite is poikilitic in pyroxene and also occurs as irregular grains marginal to pyroxene. Sphene occurs in wedge-shaped crystals within, and marginal to pyroxene. Traces of plagioclase (An8) occur as irregular patches along margins of some potassium feldspar grains. Potassium feldspar forms irregular grains with pyroxene inclusions. Traces of dark brown stilpnomelane were noted between pyroxene and feldspar.

Reference No. 283
Sample No. WPR3-18

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, trachytoidal. Fragments of more leucocratic syenite occur in more mafic syenite. Sample was taken from homogeneous, more mafic portion of outcrop. Map unit 2f.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porpyritic-seriate, hypidiomorphic. Plagioclase (An2) occurs between potassium feldspar grains in trace amounts. Light green clinopyroxene occurs as subhedral to anhedral crystals, with local rimming of light green amphibole. Minor stilpnomelane occurs between the pyroxene grains. Feldspar is a cryptoperthite. Sphene is euhedral, poikilitic within, and marginal to potassium feldspars. Apatite is poikilitic in pyroxene and also occurs as large irregular crystals marginal to pyroxene.

Reference No. 284
Sample No. WPR3-19A

Melanocratic pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic-seriate. Phase forms less than a visually estimated 1% of outcrop and is gradational into WPR3-19B. It is porphyritic and slightly more mafic than WPR3-19B. Rock closely approximates map unit 2g. Map unit 2f.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Clinopyroxene is euhedral to subhedral, and light green in colour. Feldspar forms irregular grains partially enclosing pyroxene; under high magnification a slightly stringy perthitic texture is evident. Sphene is euhedral, poikilitically enclosed in pyroxene, and marginal to pyroxene. Apatite forms euhedral poikilitic grains in pyroxene and large irregular grains marginal to the pyroxene grains.

Reference No. 285
Sample No. WPR3-19B

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate. Fresh surfaces are pinkish green, weathered surfaces dark green-pink. Map unit 2f.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Stilpnomelane occurs as dark reddish brown grains interstitial to pyroxene. Pyroxene is light pale green clinopyroxene. Feldspar forms irregular grains partially enclosing pyroxene. Sphene and apatite are accessory minerals.

Reference No. 286
Sample No. WPR3-24

Pyroxene syenite.

Field Description. Coarse grained, massive, leucocratic. Feldspars have grey cores and pink-grey rims. Mafic content is on the order of 10%. The texture of the rock is possibly cataclastic on weathered surface. Map unit 2b.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic, weakly cataclastic. Plagioclase (An2) occurs along grain boundaries and fractures. Potassium feldspar is a string perthite and has undulating extinction. Pyroxene forms light green subhedral to euhedral grains with the maximum extinction of augite. Apatite and sphene occur as accessory minerals.

Reference No. 287
Sample No. WPR3-31

Leucocratic pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Fine to coarse grained, massive, inequigranular-porphyritic-seriate, allotriomorphic, with curved to straight grain boundaries. Plagioclase (An6) forms interlocking mosaics of grains marginal to larger irregular grains of string perthite. Locally perthite is patchy. Pyroxene is present as light green anhedral grains.

Reference No. 288
Sample No. WPR3-33

Melanocratic pyroxene syenite.

Field Description. Medium grained, massive, equigranular, apatite-rich. Map unit 2g.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Clinopyroxene is light green and euhedral to subhedral. Larger pyroxenes are commonly zoned from colourless cores to green rims. Perthite grains are interlocking with each other and form interlocking mosaics with anhedral irregular grains of apatite.

Reference No. 289
Sample No. WPR3-34A

Leucocratic amphibole syenite.

Field Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate. Phenocrysts up to 1.5 cm across compose 35-40% of the rock. A golden sheen is evident on some crystals. The outcrop has coarse grained syenite pegmatites in gradational contact with the mafic syenite, and is cut by granitic aplite dikes. Map unit 2f.

Petrographic Description. Medium grained, inequigranular–seriate, massive, allotriomorphic, with curved to straight grain boundaries. Plagioclase (An2) occurs as an interlocking mosaic of grains marginal to perthite grains and as strings within the perthite. Amphibole after pyroxene is a light green colour. Perthite forms anhedral grains with exsolved(?) strings of plagioclase.

Reference No. 290
Sample No. WPR-34B

Pyroxene syenite.

Field Description. Similar to sample WPR3-34A only coarser grained. Map unit 2f.

Petrographic Description. Medium to coarse grained, massive, equigranular–porphyritic–seriate, hypidiomorphic. Clinopyroxene is light green and forms euhedral to subhedral crystals with scattered apatite inclusions. Apatite is generally euhedral, occurring mostly as poikilitic inclusions in pyroxene. Perthite occurs as large irregular grains with a weak suggestion of string perthite at high magnification.

Reference No. 291
Sample No. WPR3-36A

Pyroxene syenite.

Field Description. Coarse grained, equigranular to inequigranular–porphyritic–seriate. The outcrop is cut by some coarse–grained syenite pegmatite dikes. Weathered surfaces are grey, fresh surfaces pink–grey. Map unit 2f.

Petrographic Description. Coarse grained, equigranular, massive, hypidiomorphic. Amphibole is light green, acicular and rims pyroxene. Clinopyroxene forms light green to subhedral crystals, altering to amphibole. Perthite occurs as irregular amoeboid grains with some evidence of string perthite; it partially engulfs pyroxene. Sphene occurs as wedge–shaped crystals.

Reference No. 292
Sample No. WPR3-37

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular–porphyritic–seriate, trachytoidal. Weathered surfaces are grey, fresh surfaces pink–grey. Map unit 2f.

Petrographic Description. Medium to coarse grained, equigranular, massive, hypidiomorphic. Plagioclase occurs as traces along grain boundaries of perthite. Perthite occurs as irregular grains of Carlsbad–twinned cryptoperthite; it partially engulfs pyroxene. Amphibole is light green and forms along periphery of some pyroxene grains. Sphene occurs as wedge–shaped crystals.

Reference No. 293
Sample No. WPR3-40C

Leucocratic pyroxene syenite.

Field Description. Coarse grained, inequigranular–porphyritic–seriate. The outcrop is cut by coarse–grained granite pegmatite. Weathered surfaces are grey–pink, fresh surfaces pink. Map unit 2f.

Petrographic Description. Coarse grained, massive, equigranular, hypidiomorphic. Amphibole occurs in minor quantities as an alteration of pyroxene. Pyroxene is light to medium green, subhedral to euhedral clinopyroxene. Feldspar is a perthite forming irregular anhedral grains with very minor clear plagioclase grains along perthite grain boundaries.

Reference No. 294
Sample No. WPR3-40D

Pyroxene syenite.

Field Description. Same as sample WPR3-40C, but with higher mafic content. Map unit 2f.

Petrographic Description. Coarse grained, massive, equigranular, hypidiomorphic. Pyroxene is light to dark green, euhedral to subhedral clinopyroxene. Locally, pyroxene is altered to a bright green amphibole. Perthite occurs as large anhedral grains locally partially enclosing pyroxene. Traces of plagioclase occur along grain boundaries of perthite. Large pyroxene grains are zoned from pale green or colourless cores to green rims.

Reference No. 295
Sample No. WPR3-41A

Pyroxene syenite.

Field Description. Medium to coarse grained, massive, equigranular. Weathered surfaces are grey to green–grey, fresh surfaces pink–grey. The rock is close to map unit 2g in texture and composition. Map unit 2f.

Petrographic Description. Medium to coarse grained, massive, equigranular, hypidiomorphic. Microcline forms irregular, anhedral interstitial grains. Plagioclase (An2) occurs as anhedral grains marginal to perthite grains. Perthite is a cryptoperthite and forms anhedral irregular grains. Clinopyroxene occurs as anhedral to euhedral grains locally altering to green amphibole.

Reference No. 296
Sample No. WPR3-41C

Pyroxene syenite.

Field Description. Coarse grained, equigranular to inequigranular-porphyritic- seriate, trachytoidal, weakly banded. Weathered surfaces are grey, fresh surfaces pink-grey. Outcrop has angular mafic xenoliths up to 120 by 54 cm. Map unit 2f.

Petrographic Description. Medium to coarse grained, massive, equigranular, hypidiomorphic. Pyroxene forms subhedral to euhedral grains with poikilitic apatite. There are traces of green amphibole alteration of pyroxene. Apatite also occurs as large anhedral grains marginal to pyroxene. Sphene occurs poikilitic in pyroxene, as crystals marginal to pyroxene, and as isolated crystals. Pyroxene is a light green clinopyroxene. Perthite forms anhedral irregular grains partially enclosing pyroxene.

Reference No. 297
Sample No. WPR3-43

Pyroxene syenite.

Field Description. Coarse grained, inequigranular-porphyritic-seriate, massive, trachytoidal with feldspars up to 3 cm in size. More mafic portions of outcrop display faint banding. Some very coarse grained feldspar pegmatite has diffuse contacts. Map unit 2f.

Petrographic Description. Medium to coarse grained, equigranular, massive, hypidiomorphic. Sphene occurs as wedge-shaped crystals, poikilitic in pyroxene, marginal to pyroxene and as isolated grains. Apatite forms irregular anhedral crystals marginal to pyroxene grains. Clinopyroxene forms subhedral to euhedral crystals of light green colour, and is altered to light green amphibole. Perthite forms irregular anhedral grains partially enclosing pyroxene. Plagioclase (An4) occurs as anhedral grains marginal to perthite and as vestiges within perthite.

Reference No. 298
Sample No. WPR3-49

Leucocratic pyroxene syenite.

Field Description. Coarse grained, massive, weakly trachytoidal, equigranular syenite with low mafic content (approximately 10%). Rock is from feldspar-rich area of outcrop and may represent local feldspar cumulate. The sample is typical of unit 2b but overall outcrop is unit 2f. The outcrop is cut by granitic pegmatite. Map unit 2b.

Petrographic Description. Medium grained, massive, equigranular, hypidiomorphic. Perthite forms irregular anhedral grains partially enclosing pyroxene. Along rims of perthite are clear colourless plagioclase (An2) grains. Pyroxene is a light green euhedral to anhedral clinopyroxene. Apatite occurs as large irregular grains marginal to pyroxene. Sphene occurs as wedge-shaped crystals. Minor light green amphibole rims pyroxene.

Reference No. 299
Sample No. WPR3-50

Leucocratic pyroxene syenite.

Field Description. Coarse grained, inequigranular-porphyritic-seriate, massive. Weathered surface looks cataclastic. Weathered surfaces are pink, fresh surfaces pink. The sample is likely a local feldspar segregation within a dominantly 2f outcrop. Map unit 2b.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Light to medium green, euhedral to subhedral clinopyroxene is locally altered to light green amphibole. Perthite forms interlocking mosaics of anhedral grains. Sphene occurs as wedge-shaped crystals, commonly in association with pyroxene.

Reference No. 300
Sample No. WPR3-51A

Melanocratic pyroxene syenite.

Field Description. Medium grained, equigranular, massive, apatite-rich. The outcrop displays discontinuous banding. Map unit 2g.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Sphene occurs as large wedge-shaped crystals, some almost as large as the field of view of the micro-

scope. Apatite occurs as irregular, large interstitial grains. Perthite forms anhedral grains, interstitial to and partially enclosing pyroxene.

Reference No. 301
Sample No. WPR3-52

Pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-seriate, weakly trachytoidal. Weak banding is parallel to trachytoidal texture. The outcrop is cut by granitic aplite. Map unit 2c.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Plagioclase (An2) forms an interlocking mosaic of tiny grains marginal to perthite. Perthite is stringy and forms anhedral grains with Carlsbad twinning. Pyroxene is very pale green to colourless, euhedral to subhedral augite, with slight alteration to amphibole. Traces of quartz are present. Sphene occurs in wedge-shaped crystals.

Reference No. 302
Sample No. WPR3-61

Pyroxene syenite.

Field Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate with weak trachytoidal texture. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Light to medium green, euhedral to subhedral clinopyroxene is locally rimmed with light green amphibole. Perthite is of two types: string and patch. Both are very well developed. Perthite grains are anhedral and display Carlsbad twinning. Plagioclase (An4) occurs as tiny anhedral grains marginal to larger perthite grains.

Reference No. 303
Sample No. WPR3-62

Pyroxene syenite.

Field Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate with weak banding and trachytoidal texture. Map unit 2c.

Petrographic Description. Medium grained, massive, equigranular, hypidiomorphic. Plagioclase (An4) forms an interlocking mosaic of anhedral grains interstitial to perthite. Sphene occurs as wedge-shaped crystals associated with pyroxene. Pyroxene forms euhedral to subhedral grains of light green colour. Perthite forms anhedral grains with stringy perthite. Some Carlsbad twinning was noted in the perthite.

Reference No. 304
Sample No. WPR3-64

Pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic-seriate, with weak trachytoidal texture. Weathered surfaces are red, fresh surfaces red-brown. Map unit 2c.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Clinopyroxene forms euhedral to anhedral light green grains. Plagioclase (An2) forms a fresh interlocking mosaic of anhedral grains enclosing ragged perthitic grains. Perthitic grains are patchy and ragged in outline. Quartz is interstitial and associated with plagioclase.

Reference No. 305
Sample No. WPR3-65

Pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are red, fresh surfaces red-brown. Map unit 2c.

Petrographic Description. Medium grained, inequigranular-porphyritic-seriate, massive, hypidiomorphic. Amphibole (hornblende) occurs as light green overgrowths on pyroxene. Pyroxene is a light green euhedral to anhedral clinopyroxene. Plagioclase (An4) forms an interlocking mosaic of anhedral grains enveloping ragged stringy perthite grains. String perthite locally approaches a patch perthite. Trace amounts of magnetite, carbonate, sphene, zircon, quartz are present.

Reference No. 307
Sample No. WPR3-68C

Pyroxene syenite.

Field Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate. The outcrop is cut by a granitic dike. Map unit 2c.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Amphibole is a light green hornblende rimming pyroxene. Plagioclase forms an interlocking mosaic of grains along perthite grain boundaries. Pyroxene is euhedral to subhedral and contains poikilitic sphene. Perthite forms irregular grains of cryptoperthite and string perthite. Apatite forms large anhedral grains.

Reference No. 308
Sample No. WPR3-69A

Pyroxene syenite.

Field Description. Coarse grained, inequigranular-porphyritic-seriate, trachytoidal. Weak banding is parallel to trachytoidal texture. Coarse grained syenite cuts medium grained syenite. Map unit 2c.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Plagioclase (An7) forms interlocking mosaics of anhedral grains. Clinopyroxene forms euhedral to subhedral grains which are light green to almost colourless. Pleochroism is not as strong as usual. Perthite forms irregular anhedral grains with local stringy perthite development. Sphene forms wedge-shaped crystals, individually, and as inclusions in pyroxene. Light green hornblende is after pyroxene. Minor disseminated magnetite is present.

Reference No. 309
Sample No. WPR3-69B

Pyroxene syenite.

Field Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate. The sampled phase is cut by a coarse grained syenite phase. Map unit 2a.

Petrographic Description. Medium grained, equigranular, massive, allotriomorphic to hypidiomorphic. Amphibole forms a light green alteration on pyroxene. Sphene forms wedge-shaped crystals, some partially enclosed in pyroxene. Plagioclase forms an anhedral mosaic of tiny grains marginal to perthite. Perthite forms irregular anhedral grains. Pyroxene is pale to light green and forms irregular subhedral crystals altering to amphibole.

Reference No. 310
Sample No. WPR3-70

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are pink-grey, fresh surfaces pink-grey. Map unit 2c.

Petrographic Description. Medium grained, equigranular to inequigranular-porphyritic-seriate, hypidiomorphic to allotriomorphic. Pyroxene is weakly pleochroic in green and tends toward augite on the basis of extinction angle. Amphibole is a light green hornblende rimming pyroxene. Plagioclase (An2) forms an interlocking mosaic of anhedral grains enveloping microcline. Microcline has weak quadrille twinning and forms irregular anhedral grains which appear bent and locally are weakly protoclastic. Trace to minor amounts of quartz, stilpnomelane, sphene, apatite and magnetite are present.

Reference No. 311
Sample No. WPR3-71

Pyroxene syenite.

Field Description. Coarse grained, inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium grained, equigranular, massive, hypidiomorphic. Clinopyroxene forms euhedral to subhedral crystals which are weakly zoned. The rims of pyroxene are more pleochroic in green than the cores. Perthite forms anhedral irregular grains partially enclosing pyroxene. Apatite forms irregular anhedral grains associated with the pyroxene. Sphene forms euhedral wedge-shaped crystals associated with the pyroxene.

Reference No. 312
Sample No. WPR3-74A

Quartz-bearing, hornblende syenite.

Field Description. Fine to medium grained, equigranular, massive. Weathered and fresh surfaces are pink. Map unit 2a.

Petrographic Description. Fine grained, equigranular, massive, allotriomorphic with curved to straight grain boundaries. Quartz forms irregular interstitial grains. Amphibole is a light green pleochroic interstitial hornblende. Plagioclase (An5) forms clear anhedral grains between an-

hedral grains of perthite. The thin section contains abundant euhedral sphene. Rock tends to be aplitic.

Reference No. 313
Sample No. WPR3-74B

Amphibole, pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, trachytoidal. Map unit 2c.

Petrographic Description. Fine to coarse grained, massive, inequigranular-seriate, allotriomorphic with curved to straight grain boundaries. Sphene forms anhedral to subhedral grains in association with pyroxene and amphibole. Green to pale green amphibole is closely associated with pyroxene. Anhedral, pale green clinopyroxene interlocks with amphibole and is clearly associated with sphene. Pyroxene is commonly turbid. Some perthite has a stringy texture but patch perthite is perhaps more common. Patch perthite is an antiperthite. Microcline is common and quadrille twinning is present in a large number of grains.

Reference No. 314
Sample No. WPR3-76A

Quartz-bearing, amphibole syenite.

Field Description. Coarse grained, equiganular to inequigranular-porphyritic-seriate, trachytoidal, weakly banded. The outcrop is cut by granitic aplite and pegmatite. Map unit 2c.

Petrographic Description. Medium grained, massive, equigranular, allotriomorphic with curved grain boundaries. Plagioclase (An2) forms anhedral, interstitial grains between perthite. Microcline has stringy perthitic texture, and locally some perthite is patchy. Amphibole forms irregular anhedral grains of pleochroic green hornblende. Sphene forms wedge-shaped crystals commonly associated with the amphibole. Minor quartz is associated with plagioclase. Rock has a weak protoclastic texture.

Reference No. 315
Sample No. WPR3-76B

Amphibole, pyroxene syenite.

Field Description. Medium to coarse grained, massive, equigranular to inequigranular-porphyritic-seriate. Rock slightly coarser grained than WPR3-76A, otherwise the same. Map unit 2c.

Petrographic Description. Medium to coarse grained, equigranular, massive, allotriomorphic to hypidiomorphic. Plagioclase (An3) forms an anhedral mosaic of clear crystals interstitial to perthite. Amphibole is a pleochroic light green hornblende. Clinopyroxene forms irregular light to pale green birefringent grains. Sphene occurs as wedge-shaped crystals. Perthite forms irregular anhedral grains.

Reference No. 316
Sample No. WPR3-77B

Amphibole pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, weakly trachytoidal. The outcrop is cut by a small aplite dike. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, equigranular, allotriomorphic with curved to straight grain boundaries. Sphene forms euhedral, wedge-shaped crystals. Pyroxene (augite) occurs as relict grains mantled with green pleochroic hornblende. Perthite (?) forms anhedral grains which have tiny anhedral plagioclase grains along margins.

Reference No. 317
Sample No. WPR3-77C

Biotite, amphibole syenite.

Field Description. Fine to medium grained, equigranular. The sample is from a 20 cm wide dike cutting coarse grained syenite. Map unit 2a.

Petrographic Description. Fine to medium grained, equigranular, massive, allotriomorphic with curved to straight grain boundaries. Biotite forms small booklets. Plagioclase (An7) forms clear anhedral grains as part of a mosaic with microcline. Feldspars are anhedral. Sphene occurs as wedge-shaped euhedral crystals. Amphibole is a green pleochroic hornblende forming irregular, anhedral grains.

Reference No. 318
Sample No. WPR3-78

Amphibole, pyroxene syenite.

Field Description. Coarse grained, equigranular to inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, equigranular to inequigranular-porphyritic-seriate, allotriomorphic with curved to straight grain boundaries. Perthite forms anhedral, irregular grains with string perthitic textures. Clinopyroxene is light to pale green, weakly pleochroic, and anhedral in outline. Pyroxene approaches augite in composition. Plagioclase (An8) forms anhedral grains marginal to perthite. Amphibole (hornblende) replaces pyroxene. Sphene forms wedge-shaped euhedral crystals.

Reference No. 319
Sample No. WPR3-87

Pyroxene, amphibole syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, allotriomorphic with straight to curved grain boundaries. Apatite forms large anhedral grains. Sphene occurs as wedge-shaped, generally euhedral grains. Clinopyroxene is weakly pleochroic in green, with extinction close to augite. Amphibole occurs as a light green hornblende, as irregular grains and as alteration of pyroxene. Plagioclase (An2) forms anhedral interlocking crystals marginal to large perthite grains. Perthite is stringy, locally patchy, irregular to rounded in outline.

Reference No. 320
Sample No. WPR3-88

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, equigranular, hypidiomorphic. Light green amphibole rims pyroxene. Pyroxene forms euhedral to subhedral crystals of clinopyroxene. Perthite is a cryptoperthite with local patches of albite twinning. Plagioclase (An8?) forms tiny grains next to grain margins. Wedge-shaped sphene crystals are common.

Reference No. 322
Sample No. WPR3-100

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, trachytoidal. The outcrop is cut by granite pegmatite and aplite. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Light green amphibole replaces pyroxene. Clinopyroxene forms euhedral to subhedral crystals. Plagioclase (An2) occurs as patches in perthite and as isolated grains marginal to larger perthite grains. Perthite forms large grains with somewhat irregular grain margins. Sphene forms wedge-shaped, euhedral crystals closely associated with pyroxene.

Reference No. 323
Sample No. WPR3-102A

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Plagioclase (An6) forms rims on perthite and occurs as isolated grains between perthite grains. Sphene forms wedge-shaped euhedral crystals. Amphibole is a light green hornblende after pyroxene. Clinopyroxene has the extinction angle of augite and forms weakly pleochroic grains rimmed with amphibole. Perthite forms large grains with stringy segregations of plagioclase.

Reference No. 325
Sample No. WPR3-105

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, well developed trachytoidal texture. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Amphibole is a light green hornblende replacing pyroxene. Pyroxene is

a light green, weakly pleochroic clinopyroxene, with minor amphibole alteration. Plagioclase (An4) rims perthite and occurs as tiny grains between perthite grains. Perthite forms anhedral grains with well developed stringy texture. Sphene occurs as wedge-shaped euhedral crystals.

Reference No. 326
Sample No. WPR3-110

Melanocratic pyroxene syenite.

Field Description. Medium grained, massive, equigranular, with high apatite content. The sample is possibly a xenolithic block in a more feldspar-rich, coarse grained phase. Map unit 2g.

Petrographic Description. Medium grained, massive, equigranular, hypidiomorphic. Apatite forms anhedral grains interstitial to pyroxene. Sphene forms euhedral to subhedral crystals, which are poikilitically enclosed in pyroxene, and occur along pyroxene grain boundaries. Pyroxene is a green anhedral to euhedral clinopyroxene. Perthite is anhedral and interstitial to pyroxene.

Reference No. 327
Sample No. WPR3-111

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are pink-grey, fresh surfaces pink. Locally, syenite has some pegmatitic segregations in outcrop. Sample homogeneous. Map unit 2c.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Clinopyroxene forms euhedral to subhedral grains. Plagioclase (An2) forms rims on perthite and occurs as isolated grains marginal to the perthite. Perthite is stringy and forms large grains with respect to the other minerals. Sphene forms euhedral wedge-shaped crystals.

Reference No. 328
Sample No. WPR3-114A

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, well developed trachytoidal texture. The outcrop is cut by granitic pegmatite and aplite. Weathered surfaces are grey-pink, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Clinopyroxene forms euhedral to subhedral grains with weak pale green pleochroism. Plagioclase (An4) forms rims on perthite, isolated grains between perthite grains, and patches within perthite. Perthite is both stringy and patchy types and forms irregular anhedral grains. Sphene forms wedge-shaped euhedral crystals.

Reference No. 330
Sample No. WPR3-120

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, trachytoidal with feldspars up to 3 cm. The outcrop is cut by granitic aplite. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, massive, hypidiomorphic. Clinopyroxene approaches aegirine-augite in composition and forms anhedral to subhedral rounded grains which may contain poikilitic grains of sphene and magnetite. Plagioclase (An6) forms tiny anhedral grains next to perthite grains. Perthite forms large anhedral grains with faint stringy texture and quadrille twinning of microcline. Sphene forms wedge-shaped euhedral crystals.

Reference No. 331
Sample No. WPR3-127

Amphibole syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, equigranular, massive, allotriomorphic to hypidiomorphic. Plagioclase (An2) forms overgrowths on perthite and occurs as anhedral grains between perthite grains. Amphibole has extinction of hornblende and is a light green colour. Perthite is stringy and occasionally patchy. Patch perthite may be a replacement feature. Sphene is crudely euhedral.

Reference No. 332
Sample No. WPR3-134B

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate. Weathered surfaces are pink-grey, fresh surfaces pink. The outcrop is cut by granitic aplite and pegmatite. Map unit 2c.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Plagioclase occurs in trace amounts marginal to perthite grains. Clinopyroxene forms euhedral to subhedral, light green crystals. Perthite forms large subhedral crystals. String perthite and cryptoperthite are both present. Sphene forms euhedral wedge-shaped crystals.

Reference No. 333
Sample No. WPW4-1

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, somewhat clotty in mafics, trachytoidal. Feldspars are up to 1 cm in length and the rock may be mildly cataclastic. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, allotriomorphic to hypidiomorphic. Plagioclase (An1?) forms an anhedral, interlocking mosaic of grains marginal to larger perthite grains. Perthite occurs as large subhedral grains with a well developed string perthite texture. Pyroxene is a subhedral to anhedral clinopyroxene. Minor amphibole is after pyroxene. Minor anhedral apatite, and some euhedral, wedge-shaped sphene crystals are present.

Reference No. 334
Sample No. WPW4-2

Pyroxene, amphibole syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate with feldspar crystals up to 2 to 3 cm in length. The outcrop is cut by a mafic band. Weathered surfaces are pink-grey, fresh surfaces grey. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Amphibole is a light green pleochroic hornblende after pyroxene. Clinopyroxene is turbid and altering to amphibole. Plagioclase (An3) forms an anhedral mosaic of grains enclosing the larger perthite grains. Plagioclase forms rims on perthite grains. String perthite forms subhedral crystals. Sphene forms wedge-shaped euhedral crystals.

Reference No. 335
Sample No. WPW4-4

Pyroxene syenite.

Field Description. Medium to coarse grained, inequigranular-seriate, well developed trachytoidal texture. Weathered surfaces are grey-pink, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Plagioclase (An2) forms an interlocking mosaic of anhedral crystals enclosing perthite. Perthite occurs as subhedral crystals with well developed stringy texture. Clinopyroxene is light green and subhedral to euhedral in outline. Sphene occurs as euhedral wedge-shaped crystals.

Reference No. 336
Sample No. WPW4-5

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, massive, hypidiomorphic. Clinopyroxene forms euhedral to subhedral crystals of light green colour. Plagioclase (An2) forms an anhedral interlocking mosaic of grains enclosing subrounded perthite grains with a well developed stringy texture. Sphene occurs as euhedral wedge-shaped crystals.

Reference No. 337
Sample No. WPW4-6

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, well developed trachytoidal texture. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Sphene forms wedge-shaped euhedral crystals. Clinopyroxene is euhedral to subhedral in outline and pale green in colour. Plagioclase (An6) forms an interlocking mosaic of anhedral grains enclosing and rimming much larger subhedral grains of string perthite.

Reference No. 338
Sample No. WPW4-8

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Plagioclase (An2) forms an interlocking mosaic of anhedral grains enclosing larger subhedral grains of string perthite. Clinopyroxene forms subhedral to euhedral grains of light green colour. Sphene forms euhedral wedge-shaped crystals.

Reference No. 339
Sample No. WPW4-9A

Amphibole, pyroxene syenite.

Field Description. Coarse grained, inequigranular-porphyritic-seriate, well developed trachytoidal texture. Weathered surfaces are pink-grey, fresh surfaces pink-grey. Map unit 2c.

Petrographic Description. Fine to coarse grained, massive, inequigranular-seriate, allotriomorphic with curved grain boundaries. Plagioclase (An10) forms an anhedral interlocking mosaic between larger perthite grains. Offset of albite twin planes suggests protoclastic texture. Amphibole occurs as acicular, pale green crystals along rims of pyroxene grains. Minor disseminated magnetite is present. Sphene forms anhedral to subhedral crystals, associated with and poikilitic within pyroxene. Clinopyroxene is pale green in colour, locally undergoing alteration to amphibole. Perthite is dominantly a stringy microcline perthite. Perthite forms large anhedral grains, some of which display Carlsbad twinning. Some patch perthite or antiperthite is present.

Reference No. 340
Sample No. WPW4-11

Amphibole, pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, weakly trachytoidal. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, massive, allotriomorphic to hypidiomorphic. Amphibole is locally acicular, light green in colour, and mantles or replaces pyroxene. Amphibole has extinction angle of hornblende. Clinopyroxene is light green, weakly pleochroic, and subhedral in outline. Plagioclase (An2) rims perthite and occurs as an interlocking mosaic of anhedral grains between perthite grains. Perthite forms relatively larger subrounded grains of string perthite.

Reference No. 341
Sample No. WPW6-16

Syenite.

Field Description. Coarse grained, inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Plagioclase (An2) forms an anhedral mosaic of interlocking grains enclosing the perthite. The perthite is stringy, but local areas of patch perthite are also present. Pyroxene is a light green, weakly pleochroic clinopyroxene. Sphene forms euhedral wedge-shaped crystals. Trace amounts of stilpnomelane are present.

Reference No. 342
Sample No. WPW6-17

Pyroxene syenite.

Field Description. Coarse grained, inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Fine to coarse grained, inequigranular-porphyritic- seriate, massive, hypidiomorphic. Clinopyroxene is present as well formed euhedral to subhedral crystals with light green colour. Perthite is stringy with subhedral outline. Plagioclase forms small interstitial grains. Sphene forms wedge-shaped crystals.

Reference No. 343
Sample No. WPW6-21

Pyroxene syenite.

Field Description. Coarse grained, inequigranular-porphyritic-seriate, strongly trachytoidal. Weathered and fresh surfaces are pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Clinopyroxene forms light green euhedral to subhedral crystals. Plagioclase (An1?) forms a mosaic of anhedral grains marginal to perthite. Perthite forms subhedral grains with stringy texture. Sphene forms euhedral wedge-shaped crystals.

Reference No. 344
Sample No. WPW6-25

Pyroxene syenite.

Field Description. Coarse grained, inequigranular-porphyritic-seriate, trachytoidal. Fresh surfaces are pink, weathered surfaces pink-grey. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Plagioclase (An8) forms an anhedral mosaic of grains marginal to perthite. Perthite forms subhedral grains with stringy texture. Pyroxene forms light green euhedral to subhedral grains of clinopyroxene. Sphene forms wedge-shaped euhedral crystals.

Reference No. 345
Sample No. WPW6-26

Pyroxene syenite.

Field Description. Coarse grained, inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are pink-grey, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, inequigranular-porphyritic-seriate, hypidiomorphic. Plagioclase (An7) forms an interlocking mosaic of anhedral grains marginal to the perthite. Perthite is stringy, subhedral and may be mantled with plagioclase. Clinopyroxene is light green and euhedral to subhedral in outline.

Reference No. 348
Sample No. WPW6-28

Pyroxene syenite.

Field Description. Coarse grained, massive, inequigranular-porphyritic-seriate, trachytoidal. Weathered surfaces are grey-white, fresh surfaces pink. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, hypidiomorphic. Pyroxene is a light green, euhedral to subhedral clinopyroxene. Perthite forms subrounded grains of string perthite. Minor anhedral apatite and some wedge-shaped, euhedral sphene are present. Plagioclase (An4) forms a mosaic of anhedral grains marginal to the perthite.

Reference No. 350
Sample No. FG7-2

Pyroxene syenite.

Field Description. Medium to coarse grained, massive, inequigranular-porphyritic-seriate, weakly trachytoidal.. Larger feldspars are blue-grey, enclosed in much finer-grained pink feldspar. Rock appears to be cataclastic. Sample is small, collected during operation Winisk Lake. Rock is moderately leucocratic with mafics approximately 15 to 20%. Map unit 2c.

Petrographic Description. Medium to coarse grained, massive, inequigranular-seriate, hypidiomorphic. Clinopyroxene forms anhedral to subhedral crystals; larger grains have pale green cores. Pyroxene is locally undergoing replacement by ragged, acicular, light green amphibole. Minor subhedral to euhedral sphene and apatite are present. Interstitial quartz is minor. Biotite occurs as isolated grains marginal to the pryoxene and as oriented inclusions in microcline. Microcline forms large interlocking anhedral grains with stringy perthite texture. Small elongate inclusions of biotite are commonly enclosed within the exsolved plagioclase, forming a noticeable criss-crossing pattern. The microcline perthite grains are commonly rimmed with exsolved untwinned plagioclase. Plagioclase (An6-8) forms an interstitial interlocking mosaic of anhedral grains to the microcline and pyroxene.

TABLE A-2. MAJOR ELEMENT ANALYSES (WEIGHT PERCENT) OF WHOLE-ROCK SAMPLES FROM THE WAPIKOPA LAKE ALKALIC ROCK COMPLEX.

	Unit 2a			Unit 2b		
Ref. No.	309	312	317	286	298	299
SiO_2	58.5	57.5	60.2	60.1	58.6	57.9
Al_2O_3	14.9	16.5	18.3	17.3	16.3	17.0
Fe_2O_3	1.95	3.03	2.44	0.73	0.97	0.58
FeO	2.00	2.18	1.67	0.84	1.16	1.01
MgO	1.68	1.26	0.80	0.77	1.58	1.21
CaO	4.97	4.00	2.06	2.23	3.86	2.86
Na_2O	2.15	2.56	4.72	2.49	1.39	0.94
K_2O	9.13	8.36	7.00	10.1	10.3	10.8
TiO_2	0.97	2.07	0.87	1.00	0.94	1.03
P_2O_5	0.86	0.19	0.17	0.13	0.67	0.33
S	<0.01	<0.01	0.04	0.05	0.01	0.15
MnO	0.07	0.06	0.04	0.03	0.03	0.02
CO_2	0.29	0.35	0.10	0.15	0.12	0.17
H_2O+	0.09	0.04	0.10	N.D.	N.D.	0.06
H_2O-	0.24	0.22	0.24	0.27	0.32	0.30
Total	97.80	98.30	98.80	96.20	96.30	94.40

	Unit 2c						
Ref. No.	287	301	302	303	304	305	307
SiO_2	56.6	56.5	59.1	58.9	59.8	61.0	58.3
Al_2O_3	15.1	13.7	15.5	14.5	16.5	15.7	15.2
Fe_2O_3	2.11	1.05	2.09	2.56	2.33	2.08	2.03
FeO	2.33	2.22	1.96	2.48	1.69	1.78	2.08
MgO	1.68	2.54	1.45	1.65	1.00	1.16	1.62
CaO	6.25	6.92	4.78	5.08	3.07	3.46	4.45
Na_2O	3.90	2.52	3.95	3.55	3.36	3.67	2.07
K_2O	6.28	7.31	6.98	6.90	8.29	7.50	9.20
TiO_2	1.05	0.95	0.93	1.12	0.74	0.91	1.22
P_2O_5	1.10	1.30	0.62	0.63	0.44	0.45	0.55
S	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MnO	0.07	0.06	0.07	0.09	0.06	0.07	0.07
CO_2	0.40	0.31	0.40	0.06	0.08	0.25	0.11
H_2O+	0.01	0.05	0.15	0.10	N.D.	0.09	0.07
H_2O-	0.24	0.24	0.21	0.23	0.23	0.20	0.22
Total	97.20	95.70	98.20	97.90	97.60	98.30	97.20

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

N.D. = Not Detected

Ref. No.	Sample No.	Ref. No.	Sample No.
309	WPR3-69B	287	WPR3-31
312	WPR3-74A	301	WPR3-52
317	WPR3-77C	302	WPR3-61
286	WPR3-24	303	WPR3-62
298	WPR3-49	304	WPR3-64
299	WPR3-50	305	WPR3-65
		307	WPR3-68C

TABLE A-2 continued.

	Unit 2c						
Ref. No.	**308**	**310**	**311**	**313**	**314**	**315**	**316**
SiO_2	56.4	59.4	58.1	58.4	61.1	60.0	59.5
Al_2O_3	15.9	15.2	16.1	15.8	17.2	17.4	18.3
Fe_2O_3	4.47	2.17	2.52	2.16	1.47	1.38	2.40
FeO	2.67	2.03	1.85	2.15	1.23	1.22	1.33
MgO	0.99	1.52	1.12	1.61	0.92	1.02	0.48
CaO	2.79	4.30	3.11	4.62	2.26	2.68	1.39
Na_2O	2.44	3.38	2.42	2.57	2.49	2.88	2.48
K_2O	8.98	7.21	9.35	8.39	10.1	9.07	9.78
TiO_2	1.48	0.99	0.95	1.06	1.01	1.23	0.91
P_2O_5	0.13	0.73	0.39	0.61	0.06	0.06	0.11
S	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MnO	0.07	0.07	0.05	0.07	0.04	0.04	0.03
CO_2	0.31	0.12	0.36	0.32	0.28	0.16	0.22
H_2O+	0.06	0.25	0.18	0.07	N.D.	0.03	0.10
H_2O-	0.26	0.12	0.22	0.23	0.26	0.25	0.21
Total	97.00	97.50	96.70	98.10	98.40	97.40	97.20

	Unit 2c						
Ref. No.	**318**	**319**	**320**	**322**	**325**	**327**	**328**
SiO_2	58.6	59.0	57.5	54.9	57.4	58.9	58.7
Al_2O_3	15.6	17.0	15.5	14.1	14.3	16.5	15.7
Fe_2O_3	1.65	1.44	1.24	1.53	1.77	1.32	2.00
FeO	2.15	1.56	1.78	2.43	2.19	1.35	1.96
MgO	1.69	1.24	1.85	2.51	2.40	1.31	1.57
CaO	5.20	3.39	4.86	7.02	6.57	3.96	4.64
Na_2O	2.79	2.21	1.52	1.62	2.25	2.16	2.75
K_2O	8.06	9.63	9.71	8.28	8.02	9.29	8.24
TiO_2	0.94	0.83	1.22	1.42	1.32	0.76	1.02
P_2O_5	0.69	0.45	0.60	1.00	0.94	0.63	0.52
S	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
MnO	0.07	0.05	0.05	0.07	0.07	0.04	0.07
CO_2	0.45	0.18	0.12	0.28	0.34	0.17	0.11
H_2O+	0.16	0.05	0.13	0.05	0.06	0.02	0.02
H_2O-	0.24	0.23	0.21	0.23	0.19	0.22	0.20
Total	98.30	97.30	96.30	95.50	97.80	96.60	97.50

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

N.D. = Not Detected

Ref. No.	Sample No.	Ref. No.	Sample No.
308	WPR3-69A	318	WPR3-78
310	WPR3-70	319	WPR3-87
311	WPR3-71	320	WPR3-88
313	WPR3-74B	322	WPR3-100
314	WPR3-76A	325	WPR3-105
315	WPR3-76B	327	WPR3-111
316	WPR3-77B	328	WPR3-114A

TABLE A-2 continued.

	Unit 2c						
Ref. No.	330	323	331	332	333	334	335
SiO_2	55.2	59.5	59.4	53.2	62.1	59.4	57.8
Al_2O_3	12.6	16.6	17.7	9.94	17.0	17.6	15.2
Fe_2O_3	1.66	1.10	2.91	1.32	1.16	2.51	2.50
FeO	2.89	1.22	1.57	3.08	1.01	1.36	2.00
MgO	3.39	1.23	0.51	5.26	0.62	0.62	1.34
CaO	8.95	3.52	1.35	13.00	2.18	1.67	4.62
Na_2O	1.44	1.91	2.65	1.14	4.28	2.32	3.86
K_2O	7.79	9.63	10.0	6.22	8.28	9.61	7.32
TiO_2	1.69	1.25	0.88	1.45	0.86	0.97	0.82
P_2O_5	3.08	0.35	0.07	1.50	0.15	0.12	0.68
S	0.02	<0.01	0.02	0.01	0.01	<0.01	<0.01
MnO	0.09	0.03	0.03	0.08	0.03	0.04	0.06
CO_2	0.11	0.50	0.26	0.20	0.28	0.12	0.52
H_2O+	0.01	0.04	N.D.	N.D.	N.D.	0.04	N.D.
H_2O-	0.22	0.18	0.20	0.32	0.27	0.24	0.23
Total	97.50	97.10	97.60	96.70	98.20	96.60	97.00

	Unit 2c						
Ref. No.	336	337	338	339	340	341	342
SiO_2	60.1	57.0	59.1	58.7	60.7	59.8	58.1
Al_2O_3	16.3	13.9	15.3	15.3	16.9	15.8	15.3
Fe_2O_3	2.22	2.89	2.28	2.49	0.93	2.20	2.52
FeO	1.26	1.90	1.52	1.41	0.92	1.44	1.82
MgO	1.11	2.06	1.38	1.52	0.73	1.52	1.52
CaO	3.15	6.34	4.38	4.50	1.98	4.21	4.63
Na_2O	4.17	3.40	3.80	3.84	3.02	4.22	2.76
K_2O	7.49	6.82	7.49	7.11	9.54	7.56	8.74
TiO_2	0.72	1.19	0.91	0.95	0.53	0.96	1.06
P_2O_5	0.45	0.94	0.60	0.56	0.19	0.59	0.63
S	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
MnO	0.06	0.09	0.06	0.07	0.02	0.06	0.06
CO_2	0.12	0.08	0.10	0.29	0.44	0.09	0.10
H_2O+	0.06	0.05	0.06	N.D.	0.07	0.03	0.02
H_2O-	0.23	0.29	0.23	0.25	0.19	0.21	0.24
Total	97.40	97.00	97.20	97.00	96.20	98.70	97.50

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

N.D. = Not Detected

Ref. No.	Sample No.	Ref. No.	Sample No.
330	WPR3-120	336	WPW4-5
323	WPR3-102A	337	WPW4-6
331	WPR3-127	338	WPW4-8
332	WPR3-134B	339	WPW4-9A
333	WPW4-1	340	WPW4-11
334	WPW4-2	341	WPW6-16
335	WPW4-4	342	WPW6-17

TABLE A-2 continued.

	Unit 2c					Unit 2d	
Ref. No.	**343**	**344**	**345**	**346**	**350**	**276**	**278**
SiO_2	59.0	56.2	59.1	58.8	61.0	49.7	50.0
Al_2O_3	16.0	13.6	15.1	15.5	15.8	5.46	5.82
Fe_2O_3	2.39	3.75	2.17	2.67	1.39	2.41	2.48
FeO	1.44	2.22	1.57	1.57	1.78	4.94	5.45
MgO	1.29	2.56	1.83	1.58	1.31	8.26	7.14
CaO	4.17	7.33	5.36	4.91	3.82	18.5	18.2
Na_2O	3.60	3.19	3.84	4.09	3.46	1.25	1.33
K_2O	8.20	6.75	7.21	6.59	8.16	2.70	3.08
TiO_2	0.88	1.26	1.07	0.97	0.84	1.69	1.23
P_2O_5	0.62	1.10	0.84	0.73	0.40	2.50	3.16
S	<0.01	<0.01	<0.01	<0.01	0.09	0.06	0.01
MnO	0.06	0.11	0.07	0.07	0.07	0.16	0.16
CO_2	0.10	0.10	0.22	0.36	0.24	0.20	0.16
H_2O+	N.D.	N.D.	0.02	N.D.	N.D.	0.07	N.D.
H_2O-	0.21	0.25	0.24	0.20	0.24	0.30	0.25
Total	98.00	98.40	98.60	98.00	98.60	98.20	98.50

	Unit 2f						
Ref. No.	**273**	**274**	**275**	**277**	**279**	**280**	**282**
SiO_2	56.1	59.4	51.9	52.8	50.5	52.7	52.5
Al_2O_3	13.3	15.7	7.65	10.3	7.44	11.0	10.0
Fe_2O_3	1.44	1.13	1.87	1.87	1.70	1.36	1.31
FeO	2.52	1.57	4.27	3.96	4.57	3.44	3.71
MgO	3.03	1.68	6.67	4.56	6.13	4.32	5.11
CaO	7.92	4.32	15.2	11.9	16.7	11.9	13.0
Na_2O	1.50	1.70	1.40	1.28	1.81	1.39	1.26
K_2O	8.45	10.3	4.52	6.25	4.17	6.30	5.57
TiO_2	1.24	0.63	1.18	1.34	0.89	1.19	1.81
P_2O_5	1.50	0.69	2.60	2.12	3.56	2.16	2.10
S	<0.01	<0.01	0.01	0.03	0.02	0.01	0.01
MnO	0.07	0.04	0.13	0.11	0.14	0.10	0.11
CO_2	0.06	0.31	0.06	0.09	0.12	0.15	0.08
H_2O+	0.05	0.05	0.03	0.01	0.03	N.D.	0.07
H_2O-	0.29	0.23	0.27	0.29	0.20	0.28	0.23
Total	97.40	97.80	97.80	96.90	98.00	96.30	96.90

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

N.D. = Not Detected

Ref. No.	Sample No.	Ref. No.	Sample No.
343	WPW6-21	273	WPR3-5B
344	WPW6-25	274	WPR3-7
345	WPW6-26	275	WPR3-8B
346	WPW6-28	277	WPR3-9B
350	FG7-2	279	WPR3-13
276	WPR3-9	280	WPR3-15A
278	WPR3-10	282	WPR3-17

TABLE A-2 continued.

	Unit 2f					
Ref. No.	283	284	285	289	290	291
SiO_2	53.0	49.9	53.5	47.6	55.2	58.2
Al_2O_3	9.64	6.48	11.2	7.96	13.0	16.5
Fe_2O_3	1.42	2.12	1.49	1.97	2.07	0.99
FeO	4.30	5.40	3.42	3.68	2.67	1.19
MgO	4.87	6.61	4.08	5.53	2.95	1.39
CaO	13.20	17.4	11.4	17.1	8.10	3.63
Na_2O	1.57	1.23	1.61	1.30	1.67	1.55
K_2O	5.59	3.44	6.62	4.40	7.71	9.87
TiO_2	1.19	1.88	1.03	0.55	2.12	1.37
P_2O_5	2.28	2.26	2.06	5.52	0.81	0.32
S	0.02	0.02	0.03	0.08	0.01	<0.01
MnO	0.12	0.16	0.10	0.12	0.08	0.03
CO_2	0.08	0.13	0.28	0.08	0.26	0.20
H_2O+	N.D.	N.D.	N.D.	0.05	0.05	0.03
H_2O-	0.26	0.32	0.31	0.26	0.29	0.25
Total	97.50	97.40	97.10	96.20	97.00	95.50

	Unit 2f						
Ref. No.	292	296	297	293	294	295	270
SiO_2	57.4	57.2	57.2	57.8	53.9	57.0	51.4
Al_2O_3	15.5	14.7	15.4	15.0	11.3	12.9	7.09
Fe_2O_3	1.39	1.35	1.30	1.08	1.73	1.85	2.12
FeO	1.78	2.06	1.78	1.78	2.99	3.05	5.20
MgO	1.80	2.32	2.01	1.87	4.14	3.21	6.56
CaO	4.58	5.87	4.91	4.78	10.9	7.67	16.6
Na_2O	1.49	1.70	1.43	1.11	0.91	1.16	1.59
K_2O	9.63	8.91	9.45	9.91	7.25	8.56	3.93
TiO_2	1.28	1.07	1.12	0.79	0.66	0.28	0.69
P_2O_5	0.48	0.83	0.48	0.55	2.25	0.92	2.96
S	<0.01	0.01	0.02	<0.01	0.02	0.01	0.07
MnO	0.05	0.06	0.05	0.05	0.10	0.11	0.17
CO_2	0.20	0.07	0.23	0.34	0.13	0.26	0.10
H_2O+	0.04	0.07	0.09	N.D.	0.01	0.02	0.24
H_2O-	0.25	0.25	0.27	0.19	0.22	0.26	0.22
Total	95.90	96.50	95.70	95.30	96.50	97.30	98.90

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

N.D. = Not Detected

Ref. No.	Sample No.	Ref. No.	Sample No.
283	WPR3-18	292	WPR3-37
284	WPR3-19A	296	WPR3-41C
285	WPR3-19B	297	WPR3-43
289	WPR3-34A	293	WPR3-40C
290	WPR3-34B	294	WPR3-40D
291	WPR3-36A	295	WPR3-41A
		270	WPR3-2A

TABLE A-2 continued.

	Unit 2g						
Ref. No.	**269**	**271**	**272**	**281**	**288**	**300**	**326**
SiO_2	46.4	50.3	47.1	43.8	47.3	46.4	45.8
Al_2O_3	2.64	7.43	4.64	2.26	5.07	3.10	3.11
Fe_2O_3	2.26	1.89	2.19	2.35	2.10	2.89	3.92
FeO	5.59	4.33	5.63	5.56	4.62	5.48	6.46
MgO	9.40	6.51	6.92	8.84	7.93	7.55	7.73
CaO	23.5	16.4	20.9	25.8	20.4	21.7	23.0
Na_2O	1.07	1.45	1.09	1.04	1.12	1.18	1.50
K_2O	0.01	4.30	2.34	0.63	2.81	1.23	0.51
TiO_2	1.02	1.28	2.59	0.33	0.66	4.72	2.60
P_2O_5	4.40	3.06	3.76	6.44	4.68	2.76	5.20
S	0.04	0.02	0.02	0.02	0.04	0.04	<0.01
MnO	0.17	0.13	0.16	0.19	0.15	0.17	0.22
CO_2	0.11	0.09	0.05	0.08	0.08	0.08	0.10
H_2O+	0.10	N.D.	N.D.	0.02	0.02	N.D.	0.02
H_2O-	0.26	0.27	0.26	0.28	0.27	0.29	0.23
Total	97.00	97.50	97.70	97.60	97.20	97.60	100.40

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

N.D. = Not Detected

Ref. No.	Sample No.	Ref. No.	Sample No.
269	WPR3-1	288	WPR3-33
271	WPR3-2B	300	WPR3-51A
272	WPR3-5A	326	WPR3-110
281	WPR3-15B		

TABLE A-3. TRACE ELEMENT ANALYSES (PPM) OF WHOLE-ROCK SAMPLES FROM THE WAPIKOPA LAKE ALKALIC ROCK COMPLEX.

	Unit 2a			Unit 2b		
Ref. No.	**309**	**312**	**317**	**286**	**298**	**299**
Ag	<1	<1	<1	<1	<1	<1
Au						
As						
Ba	6900	8300	5500	7300	1.3%	1.1%
Be	3	3	<1	<1	<1	<1
Bi						
Co	11	10	5	5	6	<5
Cr	10	5	5	<5	14	9
Cu	48	130	48	31	19	33
Ga	15	15	15	10	15	15
Hg						
Li	9	4	6	<3	3	<3
Mn						
Mo	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30
Ni	6	<5	<5	5	12	11
Pb	26	28	69	20	22	19
Rb	150	100	50	190	140	190
Sb						
Sc	5	<5	<5	<5	6	<5
Sn	<3	<3	<3	<3	<3	<3
Sr	5000	5000	2000	4000	4000	6000
Ti						
V	40	90	45	30	20	20
Y	45	45	45	20	30	20
Zn	78	84	81	27	33	21
Zr	250	350	1500	90	150	70
La	500	300	500	100	200	150
Nd	700	450	350	<300	300	300
Eu	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
309	WPR3-69B	286	WPR3-24
312	WPR3-74A	298	WPR3-49
317	WPR3-77C	299	WPR3-50

TABLE A-3 continued.

	Unit 2c						
Ref. No.	**287**	**301**	**302**	**303**	**304**	**305**	**307**
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	8600	1.1%	6500	5900	7500	6500	8300
Be	3	<1	5	7	6	4	<1
Bi							
Co	12	12	11	11	10	11	14
Cr	15	26	10	13	13	11	12
Cu	42	43	18	18	8	6	69
Ga	15	15	15	15	15	15	15
Hg							
Li	6	5	9	12	8	6	6
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	13	22	<5	9	<5	6	7
Pb	41	20	40	34	49	40	33
Rb	100	120	130	140	280	210	120
Sb							
Sc	5	8	<5	5	<5	<5	5
Sn	<3	<3	<3	<3	<3	<3	<3
Sr	5000	4000	4000	4000	4000	4000	6000
Ti							
V	90	45	50	40	30	35	60
Y	45	25	45	40	25	35	45
Zn	102	64	114	135	110	98	74
Zr	800	200	700	1000	300	250	300
La	450	400	450	450	250	400	400
Nd	600	600	600	600	300	450	600
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
287	WPR3-31	304	WPR3-64
301	WPR3-52	305	WPR3-65
302	WPR3-61	307	WPR3-68C
303	WPR3-62		

TABLE A-3 Continued.

	Unit 2c						
Ref. No.	308	310	311	313	314	315	316
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	1.1%	6200	8000	7700	6100	8300	6600
Be	<1	3	3	4	3	2	<1
Bi							
Co	13	8	8	9	5	6	<5
Cr	6	6	10	11	5	6	5
Cu	115	34	28	98	20	30	72
Ga	15	15	15	15	15	15	15
Hg							
Li	6	8	4	6	3	3	3
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	<5	7	<5	<5	<5	<5	<5
Pb	38	29	27	31	28	31	37
Rb	200	80	70	120	100	90	110
Sb							
Sc	<5	<5	<5	<5	<5	<5	<5
Sn	<3	<3	<3	<3	<3	<3	<3
Sr	6000	4000	7000	6000	5000	4000	6000
Ti							
V	90	60	60	60	35	40	35
Y	25	45	30	45	20	30	15
Zn	108	66	90	89	52	52	59
Zr	250	250	350	300	300	300	200
La	150	500	250	500	150	150	150
Nd	350	800	350	450	<300	<300	<300
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
308	WPR3-69A	314	WPR3-76A
310	WPR3-70	315	WPR3-76B
311	WPR3-71	316	WPR3-77B
313	WPR3-74B		

TABLE A-3 Continued.

	Unit 2c						
Ref. No.	**318**	**319**	**320**	**322**	**325**	**327**	**328**
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	6200	8200	1.1%	1.3%	9100	1.3%	7900
Be	4	3	<1	<1	<1	<1	4
Bi							
Co	8	6	9	14	14	6	8
Cr	14	9	12	15	41	9	16
Cu	28	16	6	163	69	52	31
Ga	15	15	15	10	15	15	15
Hg							
Li	6	4	8	6	6	4	6
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	11	5	12	15	23	<5	9
Pb	30	26	27	29	26	27	48
Rb	80	80	110	60	70	80	80
Sb							
Sc	7	<5	6	8	8	<5	6
Sn	<3	<3	<3	<3	<3	<3	<3
Sr	6000	7000	6000	5000	4000	7000	5000
Ti							
V	60	35	40	60	60	20	50
Y	45	35	45	50	50	30	45
Zn	94	57	52	74	76	54	98
Zr	300	200	250	200	300	250	250
La	500	450	350	500	450	400	450
Nd	700	500	500	700	600	450	500
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
318	WPR3-78	325	WPR3-105
319	WPR3-87	327	WPR3-111
320	WPR3-88	328	WPR3-114A
322	WPR3-100		

TABLE A-3 Continued.

	Unit 2c						
Ref. No.	**330**	**323**	**331**	**332**	**333**	**334**	**335**
Ag	<1	5	<1	<1	<1	<1	<1
Au							
As							
Ba	8400	1.1%	5100	9200	4800	8400	5200
Be	3	<1	<1	3	4	2	4
Bi							
Co	17	6	8	19	<5	<5	11
Cr	50	9	9	77	<5	<5	20
Cu	18	32	169	57	19	118	6
Ga	10	10	15	8	15	15	15
Hg							
Li	7	3	<3	7	4	5	6
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	25	5	5	46	<5	<5	13
Pb	16	21	32	26	27	49	38
Rb	90	60	100	80	80	80	90
Sb							
Sc	10	<5	<5	15	<5	<5	<5
Sn	<3	<3	<3	<3	<3	<3	<3
Sr	4000	6000	5000	2000	3000	6000	5000
Ti							
V	60	35	60	50	40	40	35
Y	50	30	10	50	25	20	40
Zn	83	38	44	77	58	79	91
Zr	250	200	150	200	200	200	300
La	500	250	<100	450	150	150	400
Nd	800	350	<300	1000	300	<300	450
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
330	WPR3-120	333	WPW4-1
323	WPR3-102A	334	WPW4-2
331	WPR3-127	335	WPW4-4
332	WPR3-134B		

TABLE A-3 Continued.

	Unit 2c						
Ref. No.	**336**	**337**	**338**	**339**	**340**	**341**	**342**
Ag	<1	<1	<1	<1	4	<1	<1
Au							
As							
Ba	4800	7100	6300	5800	5400	5300	5300
Be	4	6	4	6	<1	4	2
Bi							
Co	8	12	7	11	6	8	12
Cr	14	13	9	20	7	16	13
Cu	15	9	<5	7	690	12	13
Ga	15	15	15	15	15	15	15
Hg							
Li	6	8	4	6	<3	<3	<3
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	30	<30	<30	<30	<30	<30
Ni	9	14	8	10	<5	8	6
Pb	75	66	42	59	40	50	34
Rb	60	100	60	80	80	70	100
Sb							
Sc	<5	6	<5	5	<5	5	<5
Sn	<3	8	<3	<3	<3	<3	<3
Sr	5000	5000	5000	6000	6000	5000	5000
Ti							
V	25	50	25	30	20	35	35
Y	30	45	30	35	10	35	30
Zn	93	125	74	90	33	78	77
Zr	300	700	300	350	150	250	200
La	300	500	400	350	100	500	300
Nd	300	800	500	400	<300	350	450
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
336	WPW4-5	340	WPW4-11
337	WPW4-6	341	WPW6-16
338	WPW4-8	342	WPW6-17
339	WPW4-9A		

TABLE A-3 Continued.

	Unit 2c					Unit 2d	
Ref. No.	343	344	345	346	350	276	278
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	4900	5600	4900	4000	5300	5000	4200
Be	3	6	3	4	<1	3	4
Bi							
Co	10	16	14	14	7	26	27
Cr	9	13	16	11	10	230	194
Cu	5	8	<5	<5	28	100	60
Ga	15	15	15	15	15	6	7
Hg							
Li	3	6	6	6	4	8	7
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	<5	13	11	8	<5	129	106
Pb	37	36	39	47	11	23	17
Rb	70	90	80	80	80	60	80
Sb							
Sc	<5	6	5	5	5	25	20
Sn	<3	<3	<3	<3	<3	<3	<3
Sr	6000	4000	4000	5000	2000	1000	2000
Ti							
V	25	50	35	35	60	100	100
Y	30	45	40	35	30	60	60
Zn	83	140	87	108	66	155	150
Zr	250	300	250	250	200	300	350
La	400	600	500	400	250	700	700
Nd	400	800	600	600	400	>0.1%	>0.1%
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
343	WPW6-21	350	FG7-2
344	WPW6-25	276	WPR3-9
345	WPW6-26	278	WPR3-10
346	WPW6-28		

TABLE A-3 Continued.

	Unit 2f						
Ref. No.	**273**	**274**	**275**	**277**	**279**	**280**	**282**
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	9300	9300	6600	1.3%	6600	1.4%	1.5%
Be	<1	<1	3	3	3	2	<1
Bi							
Co	11	7	20	20	20	19	21
Cr	35	20	214	39	64	33	78
Cu	14	8	34	300	24	51	54
Ga	15	15	7	9	7	8	7
Hg							
[illegible]	3	<3	5	6	7	4	4
Mn							
Mo	<1	4	4	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	9	2	16	31	38	22	42
Pb	27	18	26	43	19	27	36
Rb	120	130	100	90	90	90	120
Sb							
Sc	10	<5	20	15	15	10	10
Sn	<3	<3	<3	<3	<3	<3	<3
Sr	3000	3000	3000	3000	3000	3000	3000
Ti							
V	60	30	100	70	50	45	45
Y	50	20	60	50	60	50	50
Zn	64	40	18	104	14	84	88
Zr	250	100	250	250	200	200	200
La	500	200	700	500	800	600	500
Nd	800	300	>0.1%	1000	>0.1%	1000	>0.1%
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
273	WPR3-5B	279	WPR3-13
274	WPR3-7	280	WPR3-15A
275	WPR3-8B	282	WPR3-17
277	WPR3-9B		

TABLE A-3 Continued.

	Unit 2f					
Ref. No.	283	284	285	289	290	291
Ag	<1	<1	<1	<1	<1	<1
Au						
As						
Ba	1.1%	5800	1.0%	1.1%	1.2%	9700
Be	<1	3	2	3	<1	<1
Bi						
Co	23	27	17	23	19	8
Cr	91	58	45	39	22	7
Cu	49	192	42	94	330	91
Ga	8	9	9	7	10	15
Hg						
Li	6	5	4	4	3	<3
Mn						
Mo	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30
Ni	39	44	34	33	26	11
Pb	21	19	24	14	14	22
Rb	120	50	120	50	110	180
Sb						
Sc	15	15	10	15	7	<5
Sn	<3	<3	<3	<3	3	<3
Sr	3000	2000	4000	3000	4000	4000
Ti						
V	60	90	60	80	60	20
Y	50	60	50	80	45	30
Zn	109	148	90	112	74	33
Zr	200	300	200	150	300	200
La	500	500	600	1000	300	150
Nd	>0.1%	>0.1%	>0.1%	>0.1%	800	300
Eu	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
283	WPR3-18	289	WPR3-34A
284	WPR3-19A	290	WPR3-34B
285	WPR3-19B	291	WPR3-36A

TABLE A-3 Continued.

	Unit 2f						
Ref. No.	**292**	**296**	**297**	**293**	**294**	**295**	**270**
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	1.4%	1.1%	1.3%	8400	8800	7700	4400
Be	<1	<1	<1	<1	<1	<1	4
Bi							
Co	11	13	10	10	13	14	23
Cr	19	17	13	18	45	<5	87
Cu	33	28	48	88	52	13	24
Ga	15	10	15	10	9	10	7
Hg							
Li	<3	<3	3	3	4	4	6
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	<30	<30
Ni	16	15	16	14	31	<5	48
Pb	17	20	21	30	21	13	29
Rb	100	100	120	70	70	80	80
Sb							
Sc	6	10	6	6	15	10	20
Sn	<3	<3	<3	<3	<3	<3	<3
Sr	4000	6000	6000	6000	5000	4000	1000
Ti							
V	40	70	50	25	60	80	80
Y	30	40	30	25	50	30	70
Zn	48	54	49	45	82	86	153
Zr	200	200	200	150	100	100	200
La	200	250	200	200	700	350	700
Nd	350	450	450	300	1000	350	>0.1%
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
292	WPR3-37	294	WPR3-40D
296	WPR3-41C	295	WPR3-41A
297	WPR3-43	270	WPR3-2A
293	WPR3-40C		

TABLE A-3 Continued.

	Unit 2g						
Ref. No.	269	271	272	281	288	300	326
Ag	<1	<1	<1	<1	<1	<1	<1
Au							
As							
Ba	1400	7100	3100	860	5300	1600	1100
Be	4	3	4	3	3	3	6
Bi							
Co	36	24	27	30	23	40	47
Cr	172	78	45	36	67	60	41
Cu	49	15	31	14	102	420	44
Ga	4	8	6	4	6	4	8
Hg							
Li	6	6	6	4	6	10	14
Mn							
Mo	<1	<1	<1	<1	<1	<1	<1
Nb	<30	<30	<30	<30	<30	45	<30
Ni	78	50	33	35	60	68	45
Pb	35	32	51	22	24	27	32
Rb	20	80	40	20	40	30	10
Sb							
Sc	25	15	15	25	<5	15	15
Sn	<3	<3	<3	<3	<3	4	<3
Sr	2000	3000	1000	2000	4000	2000	1500
Ti							
V	90	70	100	60	90	150	100
Y	80	60	80	100	70	100	90
Zn	150	18	142	156	130	148	310
Zr	250	250	300	250	200	700	900
La	900	700	900	>0.1%	800	1000	>0.1%
Nd	>0.1%	>0.1%	>0.1%	>0.1%	>0.1%	>0.1%	>0.1%
Eu	<100	<100	<100	<100	<100	<100	<100

Notes: For sample descriptions, see Table A-1. Analyses by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Ref. No.	Sample No.	Ref. No.	Sample No.
269	WPR3-1	288	WPR3-33
271	WPR3-2B	300	WPR3-51A
272	WPR3-5A	326	WPR3-110
281	WPR3-15B		

TABLE A-4. NORMATIVE MINERALS (CIPW NORM) FOR WHOLE-ROCK SAMPLES FROM THE WAPIKOPA LAKE ALKALIC ROCK COMPLEX.

	Unit 2a			Unit 2b		
Ref. No.	309	312	317	286	298	299
S.G.	2.72	2.75	2.68	2.66	2.68	2.69
AP	2.053	0.451	0.401	0.315	1.622	0.817
PO	0.028	0.028	0.112	0.143	0.029	0.439
IL	1.896	4.023	1.681	1.673	1.863	1.564
OR	55.568	50.605	42.125	62.396	63.592	68.137
AB	18.717	22.166	40.630	22.003	12.275	8.483
AN	4.130	9.023	8.195	6.443	8.127	10.920
C	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0
MT	2.909	1.177	2.749	0.0	1.085	0.0
HM	0.0	2.289	0.586	0.762	0.264	0.619
WO	0.972	0.466	0.0	0.0	0.0	0.0
EN	0.0	0.0	1.641	0.479	1.478	2.525
FS	0.0	0.0	0.0	0.0	0.0	0.0
Q	3.379	2.845	1.047	2.334	3.994	4.737
DI	9.285	6.926	0.833	3.287	5.670	1.487
FO	0.0	0.0	0.0	0.0	0.0	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0
LC	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0
HE	1.062	0.0	0.0	0.164	0.0	0.0
CC	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.275
NS	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0

S.G. - Specific Gravity; AP - Apatite; PO - Pyrrhotite; IL - Ilmenite;
OR - Orthoclase; AB - Albite; AN - Anorthite; C - Corundum; AC - Acmite;
MT - Magnetite; HM - Hematite; WO - Wollastonite; EN - Enstatite; FS - Ferrosilite;
Q - Quartz; DI - Diopside; FO - Forsterite; FA - Fayalite; NE - Nepheline;
LC - Leucite; KP - Kaliophilite; HE - Hedenbergite; CC - Calcite; RU - Rutile;
NS - Na_2SiO_3; KS - Kalsilite; CR - Chromite; LN - Larnite

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
309	WPR3-69B	286	WPR3-24
312	WPR3-74A	298	WPR3-49
317	WPR3-77C	299	WPR3-50

TABLE A-4 Continued.

	Unit 2c						
Ref. No.	287	301	302	303	304	305	307
S.G.	2.78	2.77	2.73	2.75	2.68	2.69	2.72
AP	2.645	3.172	1.476	1.499	1.049	1.068	1.318
PO	0.085	0.029	0.028	0.028	1.028	0.028	0.028
IL	2.067	1.898	1.813	2.182	1.445	1.767	2.394
OR	38.499	45.478	42.373	41.875	50.404	45.367	56.219
AB	34.199	22.425	34.300	30.817	29.221	31.754	18.093
AN	5.319	4.691	4.033	3.317	5.585	4.289	5.150
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	3.171	1.601	3.110	3.808	3.473	3.084	3.041
HM	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WO	2.327	0.099	2.067	2.121	0.0	0.740	0.801
EN	0.0	0.0	0.0	0.0	0.015	0.0	0.0
FS	0.0	0.0	0.0	0.0	0.000	0.0	0.0
Q	0.761	2.872	1.985	3.878	3.240	5.268	3.545
DI	9.353	14.350	7.994	9.093	5.490	6.372	8.990
FO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	1.575	3.384	0.822	1.381	0.052	0.263	0.421
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
287	WPR3-31	304	WPR3-64
301	WPR3-52	305	WPR3-65
302	WPR3-61	307	WPR3-68C
303	WPR3-62		

TABLE A-4 Continued.

	Unit 2c						
Ref. No.	**308**	**310**	**311**	**313**	**314**	**315**	**316**
S.G.	2.74	2.71	2.70	2.72	2.64	2.68	2.67
AP	0.313	1.746	0.943	1.452	0.142	0.144	0.264
PO	0.028	0.028	0.029	0.028	0.028	0.028	0.028
IL	2.918	1.938	1.880	2.066	1.960	2.409	1.787
OR	55.143	43.964	57.630	50.928	61.032	55.317	59.814
AB	21.432	29.480	21.336	22.314	21.522	25.124	21.695
AN	6.109	5.143	5.655	6.950	6.024	7.978	6.386
C	0.0	0.0	0.0	0.0	0.0	0.0	1.407
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	4.642	3.243	3.439	3.214	1.119	0.439	1.732
HM	1.439	0.0	0.254	0.0	0.730	1.120	1.287
WO	0.119	0.110	0.0	0.0	0.0	0.0	0.0
EN	0.0	0.0	0.105	0.005	0.526	0.697	1.236
FS	0.0	0.0	0.0	0.001	0.0	0.0	0.0
Q	2.336	5.176	2.687	3.210	3.002	2.599	4.365
DI	5.521	8.417	6.043	8.864	3.915	4.146	0.0
FO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	0.0	0.755	0.0	0.968	0.0	0.0	0.0
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
308	WPR3-69A	314	WPR3-76A
310	WPR3-70	315	WPR3-76B
311	WPR3-71	316	WPR3-77B
313	WPR3-74B		

TABLE A-4 Continued.

	Unit 2c						
Ref. No.	318	319	320	322	325	327	328
S.G.	2.74	2.69	2.72	2.77	2.77	2.70	2.73
AP	1.643	1.078	1.452	2.445	2.243	1.519	1.241
PO	0.028	0.028	0.029	0.058	0.028	0.028	0.028
IL	1.832	1.628	2.418	2.842	2.578	1.500	1.994
OR	48.924	58.841	59.930	71.613	48.787	57.106	50.156
AB	24.224	19.315	13.419	14.444	19.578	18.992	23.943
AN	6.378	8.261	7.058	7.085	5.358	8.171	6.314
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	2.455	2.157	1.876	2.338	2.639	1.989	2.984
HM	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WO	0.445	0.0	0.026	1.029	1.581	0.0	0.819
EN	0.0	1.176	0.0	0.0	0.0	0.625	0.0
FS	0.0	0.136	0.0	0.0	0.0	0.032	0.0
Q	2.590	2.599	2.870	2.152	3.043	3.808	3.162
DI	9.316	4.343	10.369	14.208	13.258	5.965	8.678
FO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	2.165	0.437	0.552	1.786	0.906	0.266	0.680
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
318	WPR3-78	325	WPR3-105
319	WPR3-87	327	WPR3-111
320	WPR3-88	328	WPR3-114A
322	WPR3-100		

TABLE A-4 Continued.

	Unit 2c						
Ref. No.	**330**	**323**	**331**	**332**	**333**	**334**	**335**
S.G.	2.82	2.69	2.67	2.91	2.66	2.68	2.73
AP	7.232	0.843	0.167	3.617	0.356	0.289	1.640
PO	0.056	0.028	0.056	0.029	0.028	0.028	0.029
IL	3.249	2.464	1.722	2.863	1.673	1.915	1.619
OR	46.641	59.122	60.929	38.246	50.168	59.073	45.006
AB	12.332	16.773	23.095	10.027	36.660	20.399	33.947
AN	4.946	8.565	6.427	3.760	2.993	7.794	2.609
C	0.0	0.0	0.226	0.0	0.0	0.647	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	2.436	0.348	2.537	1.990	0.808	1.694	3.768
HM	0.0	0.902	1.248	0.0	0.631	1.440	0.0
WO	0.0	0.0	0.0	4.322	1.126	0.0	2.617
EN	2.181	0.587	1.308	0.0	0.0	1.605	0.0
FS	0.318	0.0	0.0	0.0	0.0	0.0	0.0
Q	5.137	4.777	2.284	1.322	2.145	5.116	0.653
DI	13.727	5.591	0.0	29.371	3.411	0.0	7.482
FO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	1.744	0.0	0.0	4.455	0.0	0.0	0.633
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
330	WPR3-120	333	WPW4-1
323	WPR3-102A	334	WPW4-2
331	WPR3-127	335	WPW4-4
332	WPR3-134B		

TABLE A-4 Continued.

	Unit 2c						
Ref. No.	336	337	338	339	340	341	342
S.G.	2.69	2.81	2.72	2.73	2.65	2.71	2.74
AP	1.076	2.259	1.437	1.347	0.462	1.391	1.504
PO	0.028	0.028	0.028	0.028	0.057	0.028	0.028
IL	1.409	2.341	1.785	1.871	1.054	1.854	2.072
OR	45.657	41.788	45.756	43.601	59.107	45.461	53.216
AB	36.359	29.799	33.205	33.683	26.764	36.197	24.038
AN	3.728	2.595	2.633	3.622	4.561	1.852	3.625
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	2.162	3.000	2.463	2.019	1.412	2.015	3.003
HM	0.797	0.925	0.656	1.189	0.0	0.847	0.523
WO	0.605	3.711	2.471	2.025	0.0	2.001	2.079
EN	0.0	0.0	0.0	0.0	0.308	0.0	0.0
FS	0.0	0.0	0.0	0.0	0.000	0.0	0.0
Q	2.035	2.092	1.910	2.151	2.830	0.0	1.508
DI	6.145	11.462	7.656	8.465	3.443	8.300	8.405
FO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.054	0.0
LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	0.0	0.0	0.0	0.0	0.001	0.0	0.0
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
336	WPW4-5	340	WPW4-11
337	WPW4-6	341	WPW6-16
338	WPW4-8	342	WPW6-17
339	WPW4-9A		

TABLE A-4 Continued.

	Unit 2c					Unit 2d	
Ref. No.	343	344	345	346	350	276	278
S.G.	2.74	2.84	2.74	2.75	2.70	3.12	3.12
AP	1.473	2.602	1.985	1.737	0.946	5.942	7.475
PO	0.028	0.028	0.028	0.028	0.252	0.169	0.028
IL	1.711	2.440	2.070	1.890	1.627	3.289	2.382
OR	49.668	40.709	43.444	39.985	49.213	16.363	18.579
AB	31.190	27.519	33.096	35.497	29.849	10.836	11.476
AN	3.336	2.892	2.701	4.569	3.526	1.338	0.821
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	2.267	3.864	2.155	2.467	2.055	3.580	3.667
HM	0.884	1.159	0.725	1.037	0.0	0.0	0.0
WO	1.911	3.688	2.473	1.809	1.190	3.405	2.764
EN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q	0.437	1.078	1.310	2.274	3.222	1.258	1.834
DI	7.096	14.021	10.014	8.706	7.175	45.458	39.112
FO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LC	0.0	0.0	0 0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	0.0	0.0	0.0	0.0	0.945	8.363	11.861
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
343	WPW6-21	350	FG7-2
344	WPW6-25	276	WPR3-9
345	WPW6-26	278	WPR3-10
346	WPW6-28		

TABLE A-4 Continued.

	Unit 2f						
Ref. No.	273	274	275	277	279	280	282
S.G.	2.78	2.69	3.01	2.92	3.05	2.92	2.94
AP	3.584	1.647	6.192	5.096	8.459	5.227	5.049
PO	0.028	0.028	0.028	0.085	0.056	0.029	0.028
IL	2.426	1.231	2.301	2.637	1.731	2.358	3.563
OR	51.487	62.702	27.450	38.307	25.266	38.871	34.146
AB	13.073	14.803	12.161	11.222	14.138	12.267	11.049
AN	4.714	4.896	1.260	4.022	0.0	5.373	5.352
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.257	0.0	0.0
MT	2.151	1.686	2.784	2.809	2.396	2.057	1.969
HM	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WO	0.374	0.0	0.663	0.965	2.175	1.230	1.816
EN	0.0	0.451	0.0	0.0	0.0	0.0	0.0
FS	0.0	0.102	0.0	0.0	0.0	0.0	0.0
Q	2.531	2.506	1.593	2.470	0.0	1.767	2.919
DI	16.766	8.315	3.6785	25.381	33.729	24.205	28.448
FO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.681	0.0	0.0
LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	2.866	1.633	8.782	7.006	11.111	6.617	5.662
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
273	WPR3-5B	279	WPR3-13
274	WPR3-7	280	WPR3-15A
275	WPR3-8B	282	WPR3-17
277	WPR3-9B		

TABLE A-4 Continued.

	Unit 2f					
Ref. No.	**283**	**284**	**285**	**289**	**290**	**291**
S.G.	2.92	3.10	2.90	3.02	2.83	2.71
AP	5.442	5.411	4.951	13.370	1.949	0.781
PO	0.056	0.057	0.085	0.229	0.028	0.029
IL	2.325	3.685	2.027	1.091	4.177	2.662
OR	34.020	21.000	40.566	27.174	47.315	61.424
AB	13.667	10.740	14.122	11.484	14.659	13.798
AN	2.810	2.055	3.898	3.004	5.377	9.348
C	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0
MT	2.118	3.172	2.238	2.982	2.749	0.0
HM	0.0	0.0	0.0	0.0	0.252	1.042
WO	1.674	5.517	1.714	0.0	4.048	0.0
EN	0.0	0.0	0.0	0.312	0.0	0.973
FS	0.0	0.0	0.0	0.093	0.0	0.0
Q	1.494	1.479	1.059	2.010	3.006	4.146
DI	26.915	36.644	22.704	30.343	16.440	5.757
FO	0.0	0.0	0.0	0.0	0.0	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0
LC	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0
HE	9.479	10.240	6.646	7.907	0.0	0.0
CC	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.040
NS	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
283	WPR3-18	289	WPR3-34A
284	WPR3-19A	290	WPR3-34B
285	WPR3-19B	291	WPR3-36A

TABLE A-4 Continued.

	Unit 2f						
Ref. No.	**292**	**296**	**297**	**293**	**294**	**295**	**270**
S.G.	2.73	2.75	2.73	2.73	2.88	2.80	3.06
AP	1.167	2.004	1.170	1.347	5.499	2.207	6.982
PO	0.029	0.029	0.058	0.029	0.057	0.028	0.195
IL	2.549	2.115	2.236	1.584	1.303	0.550	1.332
OR	59.717	54.855	58.752	61.881	44.590	52.351	23.636
AB	13.216	14.971	12.717	9.914	8.006	10.148	13.678
AN	7.480	6.389	8.055	7.019	5.526	4.844	0.601
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	2.113	2.037	1.981	1.653	2.608	2.773	3.125
HM	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WO	0.0	0.0	0.0	0.0	0.0	0.0	1.283
EN	0.037	0.169	0.384	0.582	0.372	0.759	0.0
FS	0.000	0.028	0.027	0.140	0.111	0.358	0.0
Q	3.520	2.948	3.448	4.535	3.801	3.127	0.553
DI	10.056	12.607	10.520	9.349	22.321	16.192	35.829
FO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	0.114	1.848	0.652	1.967	5.805	6.664	12.786
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
292	WPR3-37	294	WPR3-40D
296	WPR3-41C	295	WPR3-41A
297	WPR3-43	270	WPR3-2A
293	WPR3-40C		

TABLE A-4 Continued.

	Unit 2g						
Ref. No.	**269**	**271**	**272**	**281**	**288**	**300**	**326**
S.G.	3.29	3.04	3.18	3.24	3.15	3.28	3.31
AP	10.579	7.311	8.961	15.361	11.208	6.587	12.055
PO	0.114	0.056	0.056	0.056	0.113	0.113	0.027
IL	2.008	2.504	5.054	0.644	1.294	9.222	4.935
OR	0.061	26.196	14.220	3.832	17.159	7.485	3.015
AB	9.383	12.635	9.475	8.343	9.783	9.352	12.684
AN	2.458	1.085	0.874	0.0	0.516	0.0	0.246
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AC	0.0	0.0	0.0	0.621	0.0	0.809	0.0
MT	3.396	2.822	3.262	3.192	3.143	3.905	5.680
HM	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WO	2.627	2.582	9.031	3.271	1.369	15.872	6.915
EN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Q	3.660	0.201	2.245	0.063	0.229	4.434	4.114
DI	52.332	36.016	38.189	48.824	43.975	41.722	41.497
FO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HE	13.382	8.592	8.632	15.793	11.210	0.498	8.832
CC	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LN	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: For sample descriptions, see Table A-1.

Ref. No.	Sample No.	Ref. No.	Sample No.
269	WPR3-1	288	WPR3-33
271	WPR3-2B	300	WPR3-51A
272	WPR3-5A	326	WPR3-110
281	WPR3-15B		

TABLE A-5. AVERAGE CHEMICAL COMPOSITIONS* (WEIGHT PERCENT AND PPM) OF LITHOLOGIC UNITS FOR THE WAPIKOPA LAKE ALKALIC ROCK COMPLEX.

	Unit 2a (N = 3)		Unit 2b (N = 3)		Unit 2c (N = 44)	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
SiO_2	58.73	1.37	58.87	1.12	58.58	1.81
Al_2O_3	16.57	1.70	16.87	0.51	15.60	1.53
Fe_2O_3	2.47	0.54	0.76	0.20	2.11	0.75
FeO	1.95	0.26	1.00	0.16	1.81	0.49
MgO	1.25	0.44	1.19	0.41	1.55	0.85
CaO	3.68	1.48	2.98	0.82	4.47	2.20
Na_2O	3.14	1.38	1.61	0.80	2.96	0.83
K_2O	8.16	1.08	10.40	0.36	8.20	1.18
TiO_2	1.30	0.67	0.99	0.05	1.03	0.23
P_2O_5	0.41	0.39	0.38	0.27	0.63	0.52
MnO	0.06	0.02	0.03	0.01	0.06	0.02
CO_2	0.25	0.13	0.15	0.03	0.24	0.13
S	0.02	0.02	0.07	0.07	0.01	0.01
H_2O+	0.08	0.03	0.02	0.03	0.05	0.06
H_2O-	0.23	0.01	0.30	0.03	0.23	0.03
LOI	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	98.30	0.50	95.63	1.07	97.49	0.78
S.G.	0.00	0.00	0.00	0.00	0.00	0.00
Ag	<1.00	0.00	<1.00	0.00	<0.75	1.16
Ba	6900.00	1400.00	2434.13	4213.96	5602.43	2603.36
Co	8.67	3.21	2.00	6.08	9.23	5.19
Cr	6.67	2.89	6.00	9.85	13.89	13.37
Cu	65.33	57.98	27.67	7.57	53.89	108.14
Li	6.33	2.52	<1.00	3.46	4.75	3.37
Ni	<1.33	6.35	9.33	3.79	5.86	10.71
Pb	41.00	24.27	20.33	1.53	35.75	12.16
Zn	81.00	3.00	27.00	6.00	81.68	27.06
Be	1.67	2.31	<1.00	0.00	2.45	2.50
Mo	<1.00	0.00	<1.00	0.00	<1.00	0.00
Sc	<1.67	5.77	<1.33	6.35	0.23	6.02
Sr	4000.00	1732.05	4666.67	1154.70	4931.82	1149.27
V	58.33	27.54	23.33	5.77	45.00	15.85
Y	45.00	0.00	23.33	5.77	34.20	11.46
Ga	15.00	0.00	13.33	2.89	14.50	1.62
Nb	<30.00	0.00	<30.00	0.00	<28.64	9.05
Rb	100.00	50.00	173.33	28.87	100.23	42.18
Zr	700.00	694.62	103.33	41.63	310.23	181.59
Sn	<3.00	0.00	<3.00	0.00	<2.75	1.66
Eu	<100.00	0.00	<100.00	0.00	<100.00	0.00
La	433.33	115.47	150.00	50.00	345.45	166.29
Nd	500.00	180.28	100.00	346.41	392.05	369.78

*The average compositions may include duplicate samples or analyses which are not listed in Tables A-2 to A-4.

TABLE A-5 . CONTINUED.

	Unit 2d (N = 3)		Unit 2f (N = 21)		Unit 2g (N = 7)	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
SiO_2	49.67	0.35	53.97	3.40	46.73	1.95
Al_2O_3	5.60	0.19	11.43	3.25	4.04	1.82
Fe_2O_3	2.43	0.05	1.60	0.37	2.51	0.69
FeO	5.12	0.29	3.19	1.21	5.38	0.71
MgO	7.85	0.62	4.02	1.78	7.84	1.01
CaO	18.40	0.17	10.68	4.88	21.67	2.95
Na_2O	1.29	0.04	1.44	0.22	1.21	0.19
K_2O	2.82	0.22	6.92	2.28	1.69	1.53
TiO_2	1.54	0.27	1.09	0.47	1.89	1.53
P_2O_5	2.75	0.36	2.00	1.48	4.33	1.27
MnO	0.15	0.02	0.10	0.04	0.17	0.03
CO_2	0.18	0.02	0.16	0.09	0.08	0.02
S	0.04	0.03	0.02	0.02	0.03	0.01
H_2O+	0.03	0.04	0.04	0.05	0.02	0.04
H_2O-	0.28	0.03	0.26	0.03	0.27	0.02
LOI	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	98.17	0.35	96.90	0.90	97.86	1.15
S.G.	0.00	0.00	0.00	0.00	0.00	0.00
Ag	<1.00	0.00	<1.00	0.00	<1.00	0.00
Ba	4733.33	461.88	3648.27	4092.51	2922.86	2407.56
Co	26.67	0.58	16.76	5.86	32.43	8.92
Cr	217.00	19.97	46.62	46.18	71.29	46.88
Cu	86.67	23.09	79.19	88.62	96.43	145.74
Li	7.67	0.58	3.00	3.18	7.43	3.41
Ni	121.00	13.00	24.62	14.51	52.71	16.81
Pb	21.33	3.79	22.62	7.59	31.86	9.65
Zn	153.67	3.21	76.48	38.41	150.57	85.17
Be	3.67	0.58	0.67	2.01	3.71	1.11
Mo	<1.00	0.00	<0.52	1.50	<1.00	0.00
Sc	23.33	2.89	10.24	6.54	15.00	10.00
Sr	1333.33	577.35	3619.05	1283.60	2214.29	994.03
V	100.00	0.00	58.81	20.79	94.29	28.78
Y	60.00	0.00	47.62	16.02	82.86	14.96
Ga	6.33	0.58	10.00	3.05	5.71	1.80
Nb	<30.00	0.00	<30.00	0.00	<19.29	28.35
Rb	70.00	10.00	97.14	31.33	34.29	22.99
Zr	316.67	28.87	195.24	56.80	407.14	276.03
Sn	<3.00	0.00	<2.71	1.31	<2.00	2.65
Eu	<100.00	0.00	<100.00	0.00	<100.00	0.00
La	700.00	0.00	497.62	258.59	614.31	429.79
Nd	0.10	0.00	338.14	374.09	0.10	0.00

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88°10'
52°58'

87°55'
52°58'

Tuttle Island

CHIPAI

WAPIKOPA LAKE

Starrup Peninsula

LAKE

no/oc

Chart A — Wapikopa Lake

Figure 3. Geology of the Wapikopa
Geology by R.P. Sage. Additional in
work files.

LEGEND

CENOZOIC[1]

QUATERNARY

RECENT

Stream, lake, and swamp deposits

PLEISTOCENE

Glacial deposits

UNCONFORMITY

EARLY PRECAMBRIAN (ARCHEAN)[2]

POST-TECTONIC GRANITIC ROCKS

Granitic Aplite and Pegmatite Dikes

3

- 3a Granite pegmatite; coarse grained, equigranular, massive.
- 3b Granite aplite; fine grained, equigranular, weakly foliated.
- 3c Granite; fine to medium grained, locally pegmatitic, commonly with trondhjemite inclusions.

INTRUSIVE CONTACT

WAPIKOPA LAKE ALKALIC ROCK COMPLEX

Syenite Dike Rocks

2

- 2a Syenite; fine to medium grained, leucocratic. Occurs as aplitic dikes and segregations.

Coarse-Grained Syenite Core Rocks

- 2b Syenite; leucocratic, coarse grained. Pyroxene < 10%.
- 2c Syenite; medium to coarse grained, commonly porphyritic, with weak trachytoid texture; pink to greenish pink on fresh surface; rarely banded.

Mafic, Medium-Grained Syenite Rim Rocks

- 2d Mafic syenite; coarsely feldspar-porphyritic; > 50% pyroxene in groundmass; commonly trachytoid.
- 2f Mafic syenite; medium to coarse grained, locally porphyritic; < 40% pyroxene; dark green to pinkish green on fresh surface.
- 2g Mafic syenite; medium grained, > 40% pyroxene; common accessory apatite; dark green to black on fresh surface.

INTRUSIVE CONTACT

PRE- OR SYNTECTONIC GRANITIC ROCKS

Orthogneiss

1

- 1a Trondhjemite, granodiorite; medium grained, equigranular, massive to shistose, commonly cut by coarse-grained granite pegmatite.

NOTES

1. Unconsolidated deposits

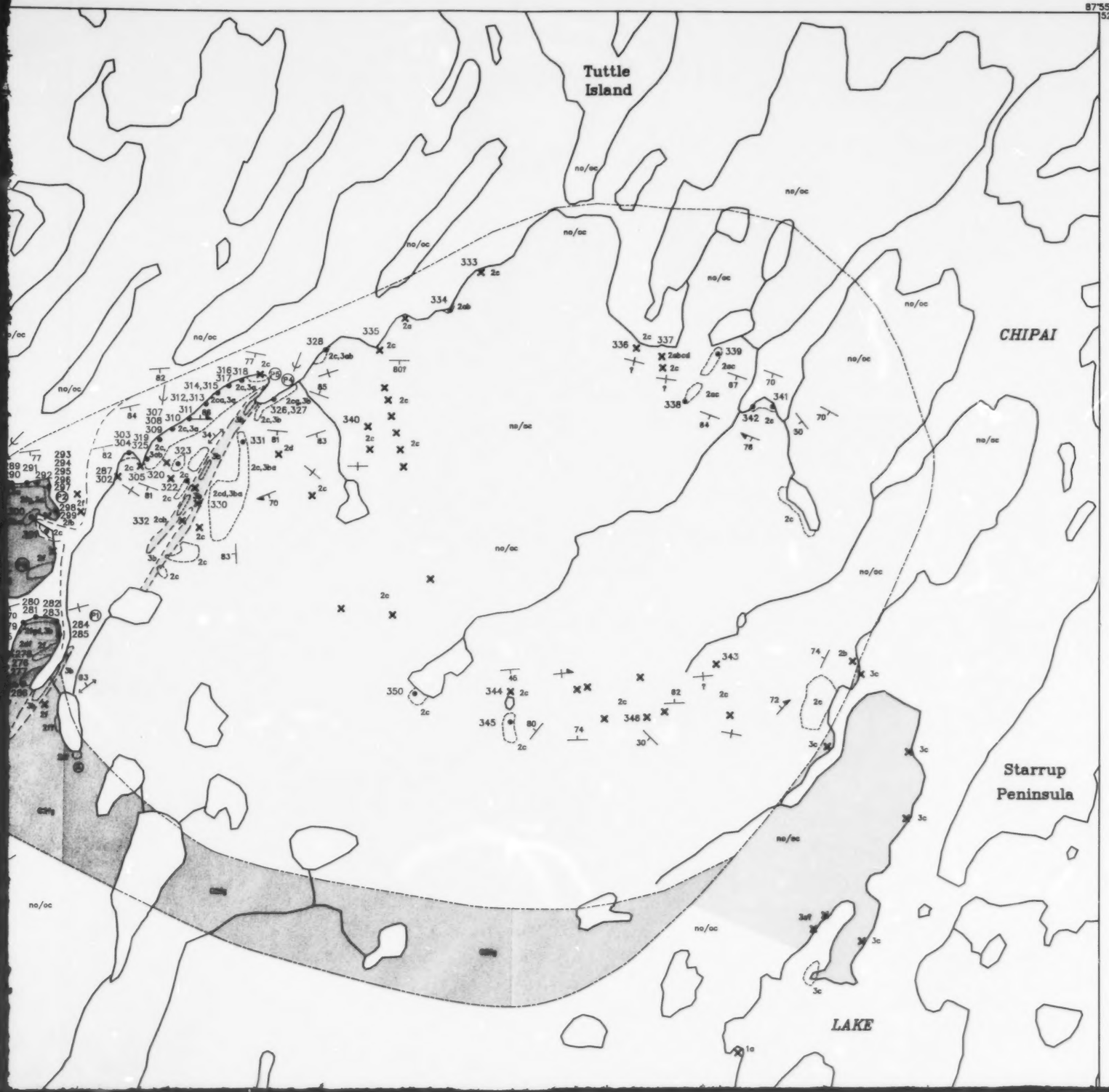

Chart A — Wapikopa Lake Alkalic Rock Complex

Figure 3. Geology of the Wapikopa Lake Alkalic Rock Complex. Geology by R.P. Sage. Additional information from assessment work files.

LEGEND

CENOZOIC[1]

QUATERNARY

RECENT

Stream, lake, and swamp deposits

PLEISTOCENE

Glacial deposits

UNCONFORMITY

EARLY PRECAMBRIAN (ARCHEAN)[2]

POST-TECTONIC GRANITIC ROCKS

Granitic Aplite and Pegmatite Dikes

3

- 3a Granite pegmatite; coarse grained, equigranular, massive.
- 3b Granite aplite; fine grained, equigranular, weakly foliated.
- 3c Granite; fine to medium grained, locally pegmatitic, commonly with trondhjemite inclusions.

INTRUSIVE CONTACT

WAPIKOPA LAKE ALKALIC ROCK COMPLEX

Syenite Dike Rocks

2

- 2a Syenite; fine to medium grained, leucocratic. Occurs as aplitic dikes and segregations.

Coarse-Grained Syenite Core Rocks

- 2b Syenite; leucocratic, coarse grained. Pyroxene < 10%.
- 2c Syenite; medium to coarse grained, commonly porphyritic, with weak trachytoid texture; pink to greenish pink on fresh surface; rarely banded.

Mafic, Medium-Grained Syenite Rim Rocks

- 2d Mafic syenite; coarsely feldspar-porphyritic; > 50% pyroxene in groundmass; commonly trachytoid.
- 2f Mafic syenite; medium to coarse grained, locally porphyritic; < 40% pyroxene; dark green to pinkish green on fresh surface.
- 2g Mafic syenite; medium grained, > 40% pyroxene; common accessory apatite; dark green to black on fresh surface.

INTRUSIVE CONTACT

PRE- OR SYNTECTONIC GRANITIC ROCKS

Orthogneiss

1

- 1a Trondhjemite, granodiorite; medium grained, equigranular, massive to shistose, commonly cut by coarse-grained granite pegmatite.

NOTES

1. Unconsolidated deposits.

SYMBOLS

- × — Small bedrock outcrop.
- Area of bedrock outcrop.
- no/oc — Area with no outcrop.
- • 345 × 344 — Location of sample for whole rock analysis (see report appendix).
- Ⓐ — Location of sample for isotopic dating (see report).
- (P1) — Location of photograph (see report).
- Schistosity; (inclined, vertical).
- Mafic banding and trachytoid texture; (inclined, vertical).
- Trachytoid texture defined by subparallel feldspars; (inclined, vertical).
- Geological boundary (position interpreted, position deduced from geophysics).
- G — Lithology interpreted from geophysics.
- Glacial striae.

WAPIKOPA LAKE

CHIPAI LAKE

Starrup Peninsula

52°51'
88°10'

52°51'
87°55'

CENOZOIC[1]

QUATERNARY

RECENT

Stream, lake, and swamp deposits

PLEISTOCENE

Glacial deposits

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2. Bedrock geology.

Scale 1:20 000

Metres 500 0 0.5

Miles 0

CHIPAI

Starrup Peninsula

LAKE

52°51'
87°55'

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Metres 500 0 0.5 1.0 1.5 Kilometres

Miles 0 0.5 Miles